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THE

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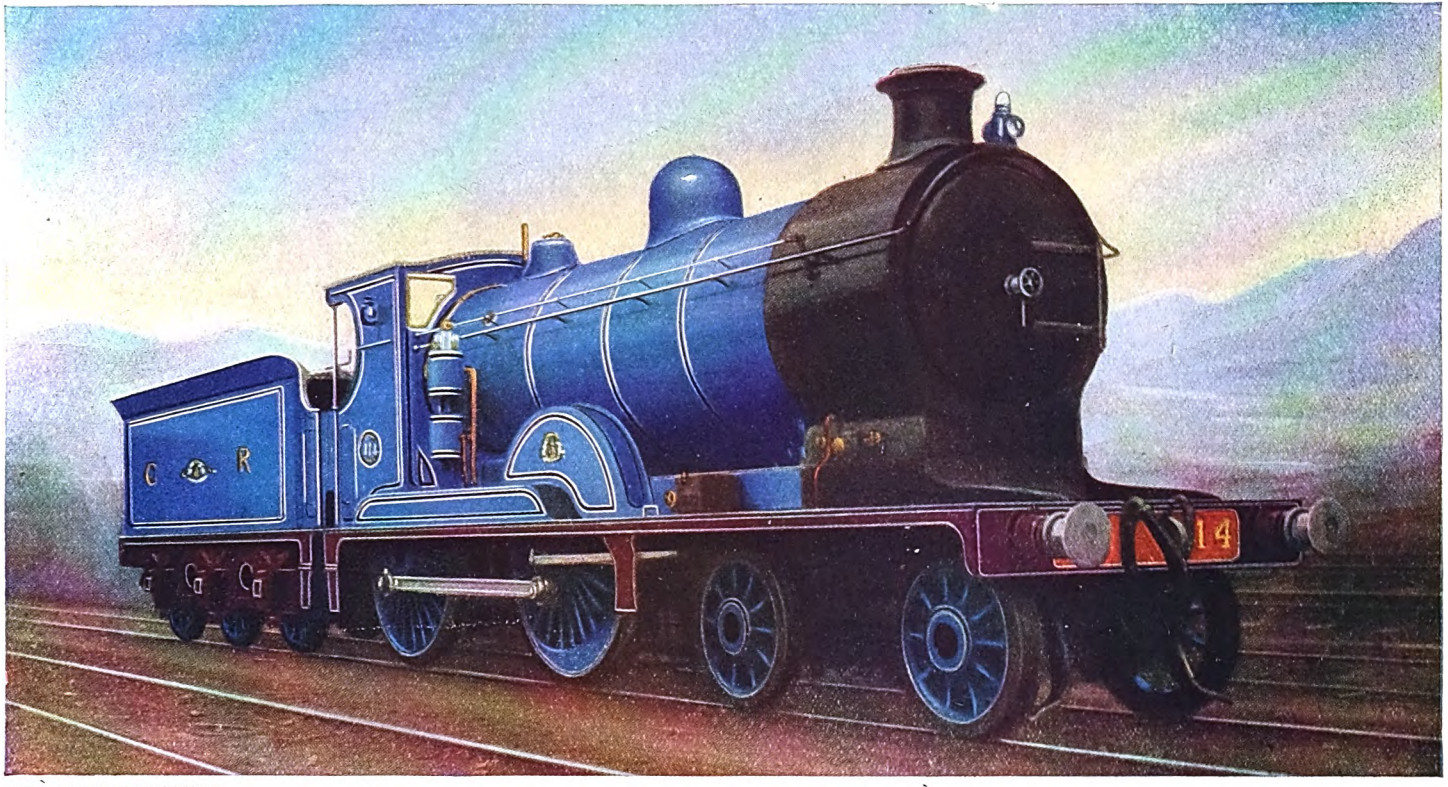

THE RAILWAY MAGAZINE.

4-4-0 SUPERHEATER MAIN LINE ENGINE No. 114: CALEDONIAN RAILWAY.

Designed by Mr. W. Pickersgill, Locomotive Superintendent, and built at St. Rollox Works.

Cylinders, 20 in. by 26 in. Coupled wheels, 6 ft. 6 in. diam. Bogie wheels, 3 ft. 6 in. diam. Steam pressure, 170 lbs. per sq. in. Heating surface—tubes, 1,220 sq. ft.; firebox, 145 sq. ft.; superheater (Robinson type), 295 sq. ft.; total, 1,660 sq. ft. Grate area, 21 sq. ft. Coal capacity, 5 tons. Water capacity, 4,200 gallons. Weight of engine and tender in working order, 110 tons.

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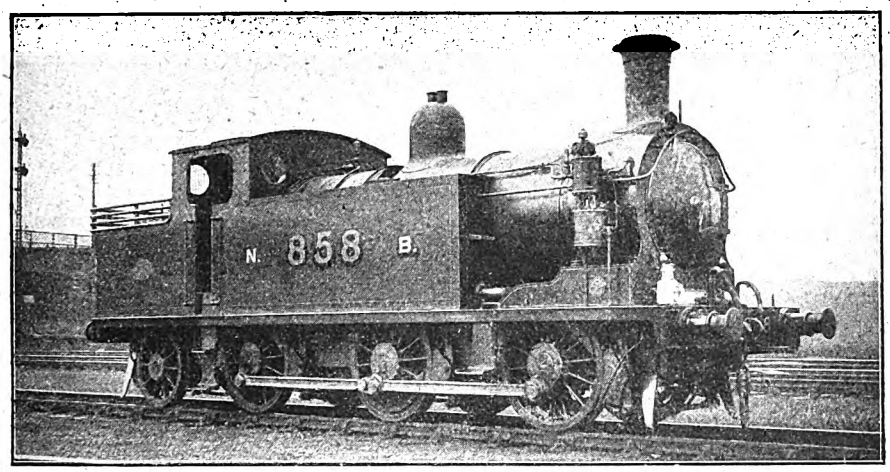

0–6–2 TANK ENGINE NO. 858: NORTH BRITISH RAILWAY.
With large numerals for reference in connection with train control system.

Locomotives on Scottish Railways.

By J. FRANCIS.

NOTWITHSTANDING their close associations with English railways, the chief Scottish lines include characteristics and features which are quite distinctive, not only among themselves, but also as compared with the Southern lines with which they are principally connected. In the case of the main line locomotives there are many similarities between the various 4–4–0 and 0–6–0 classes, but these are designs which even the wider variety afforded by the larger number of English lines do not create very distinctive differences, the general rule being for express passenger engines coupled wheels about 6 ft. 6 in. diameter and cylinders 19 in. (20 in. with superheaters) by 26 in., and boilers in about the same proportions. Similarly, the ordinary goods engines have coupled wheels about 5 ft. diameter, and the differences are principally in respect of details. For steep gradient work the Highland and Glasgow and South Western Railways use coupled wheels of about 6 ft. diameter for 4–4–0 engines, and the North British of 5 ft. 7 in. diameter.

But in the case of more advanced types there are wider differences. Both the Caledonian and the Glasgow and South Western have 4–6–0 classes with 6 ft. 6 in. wheels, and these are kept fairly strictly to the main routes. The Caledonian and the Highland have mixed-traffic 4–6–0 engines with 5 ft. 9 in. coupled wheels, and both have also a corresponding goods or steep gradient class with 5 ft. wheels, though the former are relatively modern engines, whereas the latter —designed by Mr. Jones—were the first 4–6–0 class to be introduced in the United Kingdom. On the other hand, the North British employ only big 4–4–2 engines for special duties, relying otherwise upon the 4–4–0 classes. The 2–6–0 is found on only two railways, the Caledonian and the Glasgow and South Western, while the only eight-coupled engines in Scotland are those of the Caledonian Railway. Altogether there are 2,018 tender engines belonging to Scottish railways, distributed as follows:

Caledonian	602
North British..	718
Glasgow and South Western	477
Highland	122
Great North of Scotland ..	99

Of these no fewer than 1,050 are of the 0–6–0 type, the North British leading with 504, followed by the Caledonian with 346, and the Glasgow and South Western with 188. The Highland has only 12 of these engines, and the Great North of Scotland none at all. In the case of 4–4–0 engines, the most numerous passenger class, the North British again leads with 184, closely followed by the Glasgow and South Western with 180, while the Caledonian has the relatively small total of 143. The Great North of Scotland is peculiar in that the whole of its tender engines are of the 4–4–0 class, these doing all kinds of work, and therefore meriting the description of "universal machines," total

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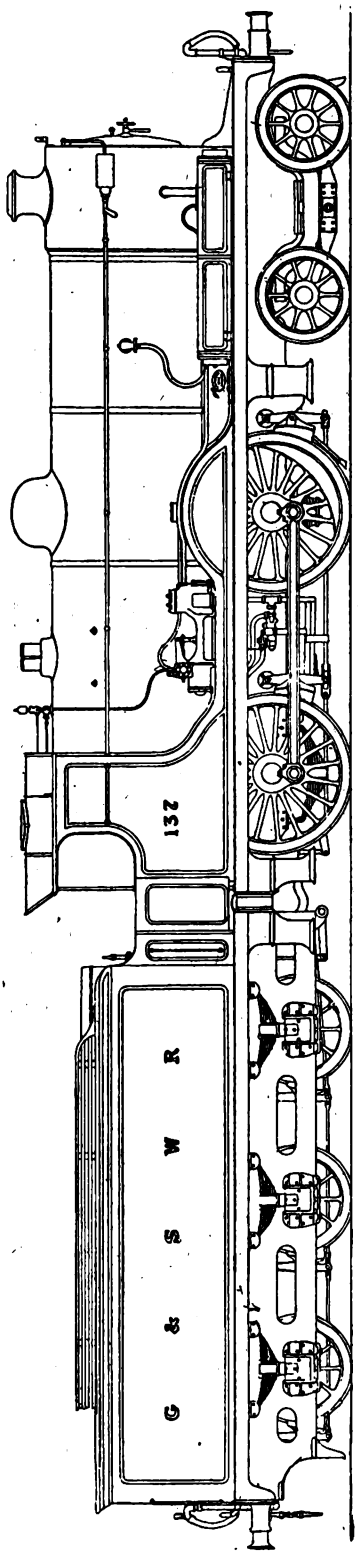

NEW 4-4-0 MAIN LINE ENGINE: GLASGOW AND SOUTH WESTERN RAILWAY.
Fitted with superheater and Weir feedwater heating appliances.

99. The Highland has a total of 76 engines of the 4–4–0 class, and many of these do a great deal of goods working. The total for the type is 682.

A pecularity of the Scottish lines is the relatively large number of 0–4–0 tender engines, there being 4 on the Glasgow and South Western and 3 on the North British Railways; half of the grand total for the United Kingdom, completed by 5 tank engines with tenders on the Festiniog narrow gauge railway and 2 on the Furness Railway. The Scottish engines are, of course, old ones, used only for suitable shunting duties, principally under conditions where larger engines cannot work, hence the retention of these engines in service.

Although the 4–6–0 engines on Scottish railways have for a long period received special attention, they only number 96 all told, and nearly half—46—are owned by the Caledonian Railway. Only seven of these—Nos. 47 and 48 and 903–7—are of the large-wheeled variety and intended for high-speed service. In addition, there are the 5 ft. class, used on the Callander and Oban section and for express goods traffic, the 5 ft. 9 in. mixed traffic class, and the engines taken over from the Highland Railway with 6 ft. coupled wheels; so that only in a minor degree and for certain trains does the Caledonian depend upon 4–6–0 engines for working its high-speed expresses.

On the other hand, the whole of the 19 4–6–0 engines on the Glasgow and South Western Railway are designed and used for true main line express work, and they are seldom seen on any other duties. The Highland has, however, the second largest total of the type, but its 31 engines, apart from the five original goods engines, are more correctly designed for mixed traffic, though their work is in practice as nearly of a true express character as the nature of the road traversed will permit. The North British has no 4–6–0 engines, but on the other hand, is the sole user of "Atlantics" in Scotland—apart from the working of North Eastern 4–4–2 engines over its metals between Berwick and Edinburgh. There are, however, only 20 of these engines, and although they do some good fast work on the "Waverley" route, it is rather for hard pulling and steady duties with heavy trains between Edinburgh and Aberdeen that they are remarkable.

The only other notable tender engines in Scotland are 5 Caledonian and 11 Glasgow and South Western 2–6–0 engines, developed from the respective 0–6–0 designs for special

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main line goods duties; and the 8 mineral 0–8–0 engines on the Caledonian Railway. Of old classes, however, there are several interesting series remaining, as follows:

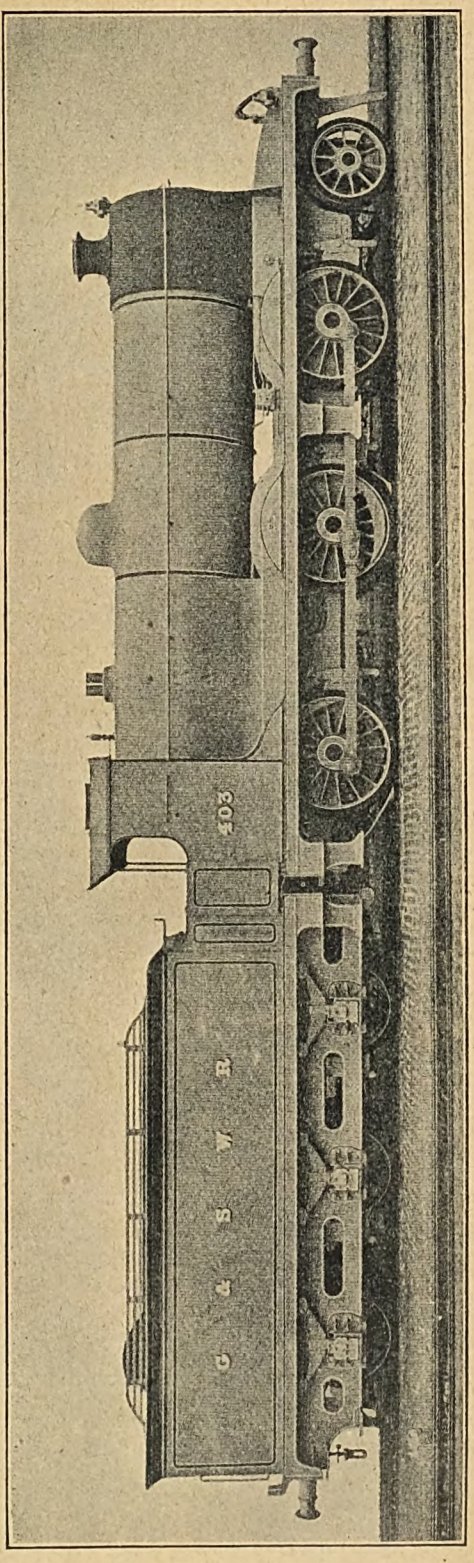
	2–4–0	0–4–2
Caledonian	19	34
Glasgow and South Western	9	66
Highland	3	—
North British	7	—
	38	100

These are all old classes, principally seen on branch or shunting duties. Many of both types on the Caledonian Railway have outside cylinders, a peculiarity in association with the 0–4–2 wheel arrangement. The 66 of that type on the Glasgow and South Western are principally the remainder of the once numerous Stirling engines described recently in Mr. Ahrons' articles. Finally, there is the one bogie single engine, No. 123, the famous "flyer" of the past, now reserved for working the Caledonian official inspection saloon.

It will therefore be seen that although Scotland has not done a great deal with special locomotive designs, its five railways between them employ most of the standard locomotive types of to-day, as follows:

0–6–0	1,050
4–4–0	682
0–4–2	100
4–6–0	96
2–4–0	38
4–4–2	20
2–6–0	16
0–8–0	8
0–4–0	7
4–2–2	1
	2,018

Of the 682 engines of the 4–4–0 type and the 1,050 0–6–0 goods engines, all except a few old 4–4–0 engines on the Great North of Scotland Railway, and the earlier Highland engines of the same type still in service, have inside cylinders, excepting, of course, No. 11, the four-cylinder engine of the Glasgow and South Western Railway. All the 2–6–0 engines are also of inside cylinder type, while it is only certain older 2–4–0 classes which have the cylinders outside, apart from more modern engines. On the other hand, all the Highland and Glasgow and South Western 4–6–0's have outside cylinders, also the North British 4–4–2's, although the true Caledonian 4–6–0 engines have them inside, the locomotives taken



2–6–0 ENGINE NO. 403: GLASGOW AND SOUTH WESTERN RAILWAY.

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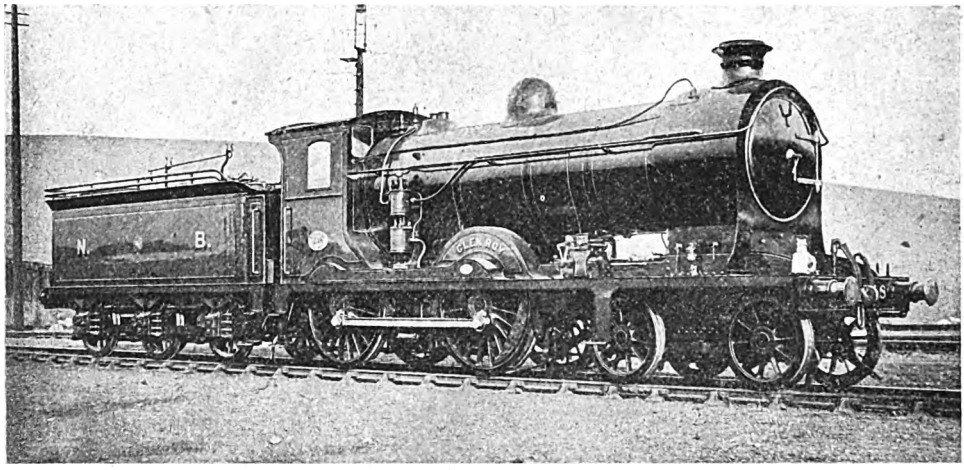

4–4–0 SUPERHEATER ENGINE USED ON THE WEST HIGHLAND SECTION, NORTH BRITISH RAILWAY.

over from the Highland Railway being the only exceptions.

Superheating is, naturally, a feature of modern practice in Scotland, as elsewhere, and the modern 4–4–0, 0–6–0 and 2–6–0 classes on the Caledonian, Glasgow and South Western and North British Railways include this feature in most cases, while some of the 4–6–0 engines on the two former lines are also equipped. Apparatus has been fitted only to one or two engines on the Great North of Scotland Railway, and has not yet been employed to any extent for Highland engines now engaged on that system, though it is a feature of the new 4–4–0 engines described on another page.

In regard to tank engines, the Scottish railways offer a considerable variety, seeing that only five lines are concerned. They cannot, however, be considered extravagantly numerous, seeing that they comprise only 841 engines of a total Scottish locomotive stock of 2,859, with 2 narrow gauge tank engines on the Campbeltown and Macrihanish Light Railway to complete the Scottish record. The Caledonian leads with 401 tank engines, 40 per cent. of the total locomotive stock of that company, while the 336 North British tank engines represent about 33 per cent. of the somewhat larger gross total of 1,054 engines of all classes.

Although the Glasgow and South Western Railway operates a heavy suburban and outer-suburban traffic, it has never taken kindly to tank engines, and even now its total is only 52, a bare 10 per cent. of the 529 engines owned by the company. Seeing that the Great North of Scotland Railway has only a limited suburban traffic in the Aberdeen district, and the Highland only certain branches to find employment for tank engines, their respective figures of 24 and 28 (gross totals 123 and 150) constitute relatively favourable proportions.

Eleven wheel arrangements are in use on Scottish railways for tank engines, but no fewer than five appear on one line only. Thus there is only one solitary 2–4–2 tank engine remaining in the whole of Scotland, presumably the last survivor of the peculiar outside-cylinder class once used on the Callander and Oban line. There is also only one 2–4–0 tank engine, a Highland veteran. Indeed, the 0–4–2 type is not very much better, for there are only three old engines on the Caledonian and four small engines recently acquired by the Great North of Scotland Railway for special duties on the quays at Aberdeen.

Remaining one-railway classes are essentially modern: six 0–8–0 mineral tank engines on the Caledonian Railway; eight 0–6–4 heavy bankers on the Highland Railway; and 35 4–4–2 tank engines—recent ones with superheaters—on the North British Railway. That the 4–4–2 wheel arrangement should still be confined to one Scottish railway is somewhat strange in view of its wide favour in England; but the now familiar 0–6–2 type is found on only two lines, to the relatively large total of 53 on

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the North British Railway, with 6 others on the Glasgow and South Western Railway.

There is an impression that the 4–4–0 type is a usual one in Scotland. It has been so; but there are now only 8 of these engines on the Highland, 16 on the Caledonian, and 33 on the North British Railway. In fact, the only really general types are the 0–4–4, 0–6–0 (all five railways each) and the 0–4–0 (all except the Highland). The highest single total is of 186 0–6–0 tank engines on the Caledonian Railway, with 146 on the North British Railway. But the former line has 137 0–4–4 engines, and the latter only 30 in view of its extensive introduction during recent years of 0–6–2 and 4–4–2 engines. The Glasgow and South Western has only 21 0–4–4 engines and 15 of the 0–6–0 type; the Great North of Scotland 9 of each; and the Highland five of the former and six of the latter.

A curious feature is the fairly large totals of the 0–4–0 engines used for shunting yards and works sidings. Of these the Caledonian has no fewer than 52 and the North British 39. The Glasgow and South Western has 10 and the Great North of Scotland 2. The following table showing type totals is of interest in this connection:

0–6–0	362
0–4–4	202
0–4–0	103
0–6–2	59
4–4–0	57
4–4–2	35
0–6–4	8
0–4–2	7
0–8–0	6
2–4–2	1
2–4–0	1

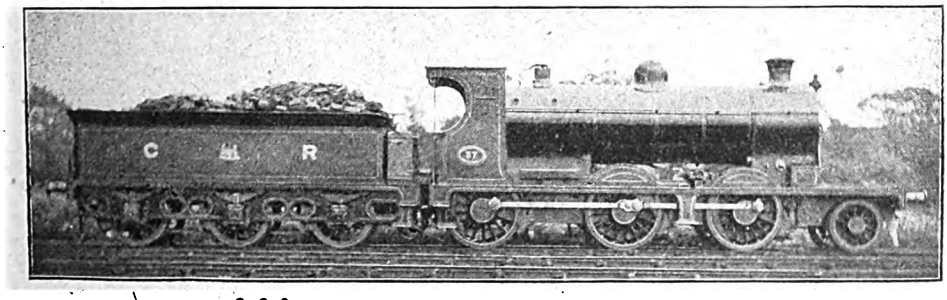
The three first mentioned may be considered as orthodox standards, while the 0–6–2 and 4–4–2 totals are fairly accurately proportioned in view of general averages reached in England. The 4–4–0 type is still used to a fair extent, though it is an old type as in England. That the 0–4–2, 2–4–0 and 2–4–2 types should have become reduced so low is somewhat strange, though they were never very widely used types in Scotland, and we can call to mind only the single 2–4–2 class to which the remaining engine belongs that was ever employed north of the border. The 0–6–4 and 0–8–0 types are still of special application; hence their employment so far on one railway only in each case.

It is worthy of note that only the Highland and North British Railways have any tank engines with more than eight wheels; and the Caledonian is the only railway in Scotland using eight-coupled engines, either tender or tank, though it has both.

From the practical point of view, the North British 4–4–2 engines of later construction are the only superheater fitted tank engines in Scotland so far, while it is only in certain 0–4–0 engines and a few of the representatives of more ancient classes that outside cylinders are employed, all others having the cylinders inside. There is a peculiar absence of saddle-tanks, except in the 0–4–0 class, nearly all the others having the usual side tanks.

It may further be mentioned that there is now only one Scottish railway using rail motor cars, these being the three steam-cars of the Glasgow and South Western Railway, and no railway north of the border has yet had anything to do with electric traction. On the other hand, the Great North of Scotland Railway redeems the situation in regard to motor road vehicles, its total of 36 passenger vehicles and 11 goods and parcels motors representing a very considerable development in view of the size and scope of the railway.

A feature of locomotive work in Scotland is the fairly close adherence to classification of engines to duties. The Caledonian has, indeed, gone somewhat further, as it has



2–6–0 SUPERHEATER ENGINE: CALEDONIAN RAILWAY.

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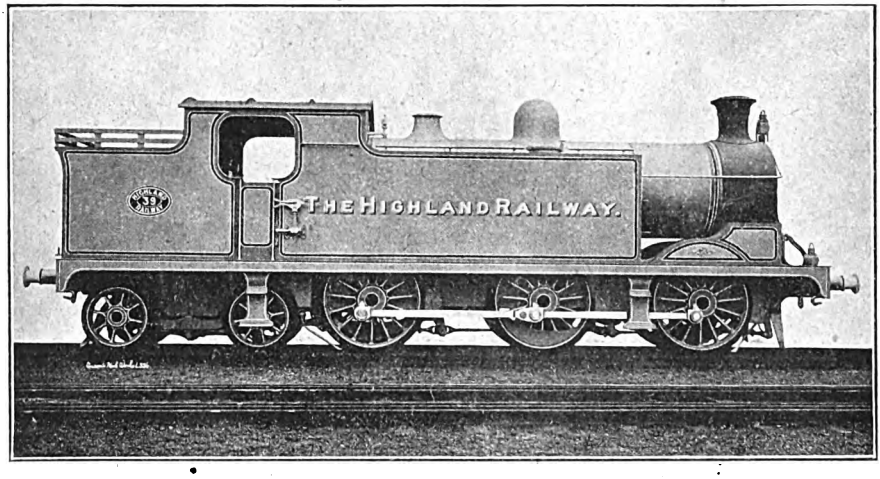
been a common practice to allocate certain engines to individual trains, these being worked day after day except when it becomes necessary to substitute another engine temporarily, or to alter duties for a particular occasion. Thus, of the big 4–6–0 engines, No. 903, *Cardean*, has for years been the regular engine of the 2.0 p.m. from Glasgow and the corresponding run with the 2.0 p.m. *ex*-Euston back from Carlisle. No. 906 was frequently on the 10.0 a.m. *ex*-Glasgow (Central) and the equivalent train back, while No. 47 was often on certain night sleeping trains between Glasgow and Carlisle, and No. 907 on the 10.0 a.m. from Buchanan Street to Aberdeen and back. The 4–4–0 engines being more numerous, with a wider variety of duties, have not been so noticeably associated with particular duties,



0–6–4 BANKING TANK ENGINE NO. 39: HIGHLAND RAILWAY.

but were so in a considerable measure. Most of the superheater engines are kept fairly closely to the main lines between Carlisle, Glasgow, Edinburgh, Perth and Aberdeen, but one finds the first, second and third "Dunalaistairs" on the Edinburgh and Glasgow road, and on the coast routes, as well as on the main lines referred to, though the original "Dunalaistairs" are naturally tending to branch work, as the corollary to their advancing age and their now relatively moderate dimensions.

The medium series of 4–6–0's are generally only found on actual main line duties between Glasgow and Aberdeen, usually with the heavy trains which call at several principal stations, the 4–4–0's and the big 4–6–0's taking the faster schedules on this route and the "flyers," such as the "Limited Mails." The 908's also work to Dundee, but otherwise are principally found on the fast Ardrossan, Wemyss Bay and other coast trains. On these routes it is by no means uncommon to find the superheater and ordinary goods engines working fairly fast trains, as, for example, to Gourock. The passenger tank engines work largely over the Glasgow Underground line, and the series thus utilised are painted black and fitted with condensing apparatus. The small-wheeled 0–4–4 class work, however, as a rule, on the Cathcart Circle services in and out of the Central High Level station. Some of the standard blue 0–4–4 tank engines, also the older 4–4–0 classes, are utilised on various country branch lines. The Callander and Oban line is now exclusively worked by the 5 ft. 4–6–0 tender engines, though some of the same class operate goods trains on other sections.

The North British Railway uses its "Atlantics" mainly between Edinburgh and Aberdeen. These are not, as a rule, very sensationally timed, but the route is a very difficult one, with frequent speed orders and other restrictions, and the principal trains are always heavy. A few work from Edinburgh to Carlisle, but the tendency now is to use the superheater 4–4–0's for this work, and certain engines of the latter class are regularly employed running between Glasgow and Edinburgh. Second class 4–4–0 engines of the 6 ft. 6 in. classes are more often found on the Edinburgh–Perth road, double-headed when necessary in view of the very severe

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grades concerned. Occasionally there may be a 5 ft. 8 in. 4–4–0 engine, but these, or rather, the later superheater series, are primarily the engines for the West Highland system. Other 5 ft. 8 in. engines are usually found on the longer distance trains over the Glasgow Underground lines, and the remainder of these classes, together with the older 6 ft. 6 in. 4–4–0 engines, take the miscellaneous trains on the varied routes which abound on the North British Railway. Such of the really old classes as remain are generally to be found on the more remote country lines, such as those in Northumberland.

Of the tank engines, the 0–6–0's operate the Edinburgh and Leith direct and Granton trains, besides other similar duties, but the big 4–4–2 engines now take many of the harder and longer trains in the Edinburgh and Glasgow districts, the 0–4–4 and 4–4–0 engines dealing with the remainder, and with some of the shorter country branches.

On the Glasgow and South Western Railway, the big 4–6–0's are the rule between Glasgow and Carlisle direct; amplified by the bigger 4–4–0's, but while it is not unusual for a 4–6–0 to work on the Ayr route, the bulk of the work there is performed by the 4–4–0 classes, the later ones on the special trains. To Greenock, in view of the severe grades, Mr. Drummond's new 6 ft. 4–4–0's have been introduced, but other engines are also employed and, speaking generally, the somewhat extensive and miscellaneous stud of 4–4–0 classes is found on all kind of duties all over the system, with the old engines on certain light duties. The 0–4–4 tanks are now principally employed on Glasgow district workmen's trains and a few other suitable duties, but a large proportion of what would be termed suburban traffic falls to trains worked by 4–4–0 engines and making journeys of 30 or 40 miles, but calling at varying stations *en route* so as to give the required facilities in combination.

The Highland Railway has virtually no suburban traffic, but there are a number of intermediate trains between Perth and Blair-Atholl, from Inverness to Nairn and Forres, etc., amplifying the general facilities. The 4–6–0 engines keep fairly strictly to the direct route between Perth and Inverness, with a few towns *viâ* Forres, but also work north of Inverness to Wick. The bigger 4–4–0 engines take a share in the eastern routes from Inverness to Elgin, Keith and Aberdeen, besides working some of the main line trains between Inverness and Aviemore *viâ* Forres and between Aviemore and Perth. Otherwise the smaller 4–4–0 and the outside-cylinder classes deal with the general passenger traffic, besides assisting on the goods side. Occasionally the 0–6–0 goods engines take passenger trains, as the demarcation between passenger and goods working is not a very strict one in view of the limited stock of true goods engines on the line. The tanks usually work branch lines, and a few do shunting, but the big 0–6–4 tank engines are primarily employed as bankers on the severe grades, though one or two are used otherwise.

On the Great North of Scotland Railway the 4–4–0 engines do all kinds of work, passenger and goods, all over the system. The 0–4–4 tanks are principally employed on the Aberdeen suburban services, the 0–6–0's being mainly yard shunters and the 0–4–0 and 0–4–2 tanks employed for special duties in and about Aberdeen.

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MR. D. A. MATHESON,

General Manager: Caledonian Railway.

Chairman, 1917: General Managers' Conference, Railway Clearing House.

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Railway Clearing House Appointments: 1917.

LAST month we referred briefly to these appointments, and we now have pleasure in dealing further. Mr. D. A. Matheson, M.I.C.E., General Manager, Caledonian Railway, who has been elected Chairman for 1917 of the General Managers' Conference, was educated at Perth Academy, and in 1877 entered the office of the late Mr. John Young, M.I.C.E., Perth, whose pupil he was until 1881. Later he acted as an Engineering Assistant on construction of the Edinburgh Suburban Railway, as an Engineering Assistant on the engineering staff of the London and North Western Railway at Manchester, and as Contractors' Resident Engineer and Agent on construction of the Lanarkshire and Ayrshire Railways. He was subsequently engaged for about five years as Resident Engineer on construction of the Glasgow Central Underground Railway, for the Caledonian Railway, on completion of which he was appointed Divisional Engineer for the Western Division of the Caledonian Railway, and in 1899 was appointed Engineer-in-Chief. On the retirement of Mr. Guy Calthrop from the position of General Manager at the end of September, 1910, Mr. Matheson was selected to succeed him. Mr. Matheson is a member of the Railway Executive Committee.

Mr. Finlay Scott, Superintendent of the Line, London, Brighton and South Coast Railway, has been elected Chairman for 1917 of the Superintendents' Conference. Mr. Finlay Forbes Scott commenced his present appointment in 1907. The age at which Mr. Scott began his railway training is uncommon. In 1871 he was left an orphan when 11 years of age, and at once commenced his career on the London, Brighton and South Coast Railway, an appointment being given to him at that unusually early age owing to his father having been for many years one of the original officers of the railway. After serving two years, he left to enter the counting house of a large mercantile establishment in the South of England, where he served five years, but, in consequence of a serious illness, he relinquished the appointment in order to seek a less sedentary occupation. He then (in 1878) rejoined the London, Brighton and South Coast Railway as clerk in the Traffic Department. After rising to the position of Chief Clerk at Clapham Junction, Mr. Scott was (in 1881) Stationmaster at Barcombe. As a stationmaster he served 21 years at different stations. In January, 1902, he was promoted to District Superintendent of the Northern Division, with offices at Croydon, which position he held until he became Superintendent of the Line.

For the Goods Managers' Conference Mr. I. T. Williams, Chief Goods Manager, London and North Western Railway, has been elected Chairman for 1917. Mr. Williams has been associated with the London and North Western Railway since 1876. After holding positions in the South and Central Wales districts and serving as District Goods Manager at Warrington, in 1907 he was transferred to London as Traffic Superintendent at Broad Street. After retaining the last-named post for just over four years, he was, in 1911, made Assistant to the General Manager, with headquarters at Euston, to deal with labour questions and the work in connection with the Conciliation Boards. From January 1st, 1914, he became Chief Goods Manager.

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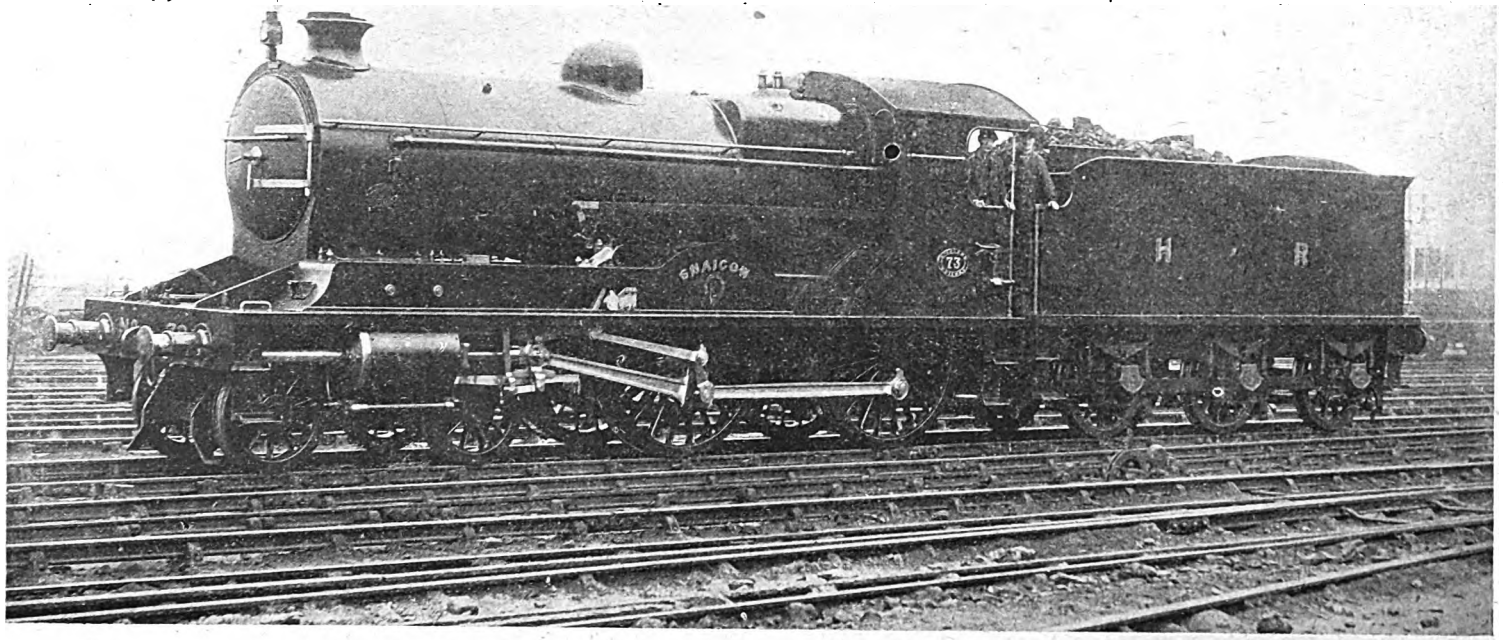
NEW 4-4-0 SUPERHEATER LOCOMOTIVE: HIGHLAND RAILWAY.

Mr. C. Cumming, Locomotive, Carriage and Wagon Superintendent.



Two engines of a new type have just been delivered by the makers, Messrs. R. & W. Hawthorne, Leslie & Company, Ltd., Newcastle-on-Tyne. These engines are intended principally for working heavy passenger trains between Inverness and the northern termini of the line. They are equipped with Robinson superheater, Walschaert valve gear, inside admission piston valves, and the firebox is of Belpaire type. No. 73, *Snaigow*, is named after the Chairman's estate. The second engine is named *Durn*, after the Deputy-Chairman's residence. Leading dimensions are:—Cylinders, 20 in. by 26 in. stroke; boiler perssure, 160 lbs. per sq. in.; coupled wheels, 6 ft. 3 in. diameter; bogie wheels, 3 ft. 3 in. diameter; water capacity of tender, 3,500 gallons; fuel capacity of tender, 7 tons; wheelbase, engine and tender, 46 ft. 5½ in.; total length over buffers, engine and tender, 58 ft. 7 in.; weight

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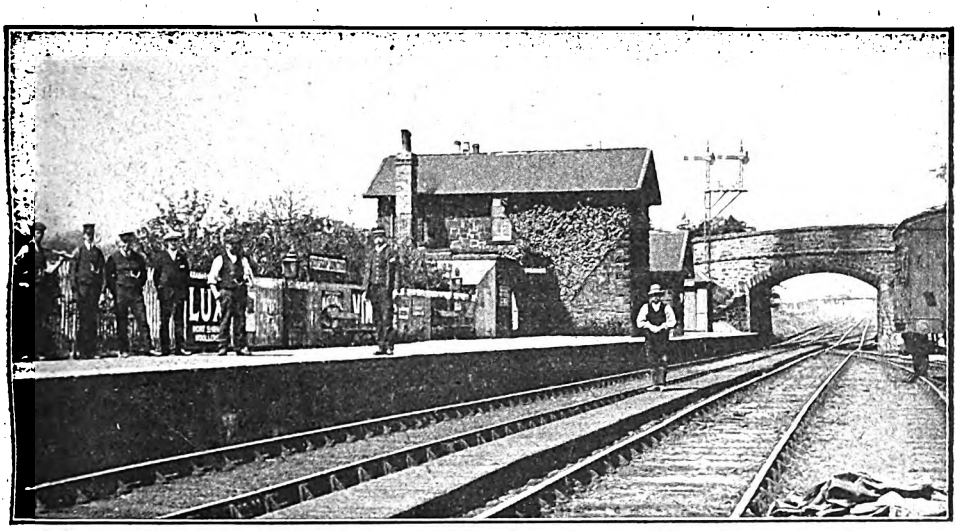

SCOTSGAP JUNCTION.
Mr. William Walker, Stationmaster, is seen standing close to the platform edge.

Rothbury and the Wansbeck and Northumberland Central Sections of the North British Railway.

By R. LENDREM-AINSLIE.

TRAVELLERS to Scotland by the East Coast Route may have been surprised when passing through Morpeth—some 16¼ miles north of Newcastle—on the North Eastern main line, to notice a North British passenger train and engine standing in the dock platform. Reference to a railway map will show that at Morpeth a branch line leaves the North Eastern main line and running almost due west joins the Border Counties section of the North British Railway at Reedsmouth Junction. This is the Wansbeck section of the North British Railway, traversing for some distance the valley of the River Wansbeck, hence the name. The line is single throughout, and the distance from Morpeth station to Reedsmouth Junction is 25 miles 13 chains. At Scotsgap Junction (11 miles 11 chains from Morpeth) a single line branch leaves the Wansbeck section for the pretty little township of Rothbury; this branch is known as the Northumberland Central section of the North British Railway and is 13 miles 4 chains in length.

Briefly, the history of these short lines in the hinterland of Northumberland is as follows. The Wansbeck Railway Company was authorised by Act of Parliament dated August 8th, 1859, and sanctioned the construction of a line from Morpeth to Reedsmouth Junction connecting there with the Border Counties section of the North British Railway. The first portion of the line from Morpeth to Scotsgap was opened on July 23rd, 1862, thereafter the remaining portions from Scotsgap to Knowesgate and Knowesgate to Reedsmouth were opened in June, 1864, and May, 1865, respectively.

In July, 1863, the Wansbeck Railway was amalgamated with the North British Railway, but as there was no direct physical connection with the parent line till the completion of the Knowesgate–Reedsmouth portion in May, 1865, the Wansbeck line may, therefore, have been worked till that time by the Blyth and Tyne Company on behalf of the North British Company, but I have been unable to get any definite information on the point. The North Eastern Railway have running powers from Morpeth to Scotsgap, which they exercise once a week for live stock traffic. The Northumberland Central section, that is from Scotsgap

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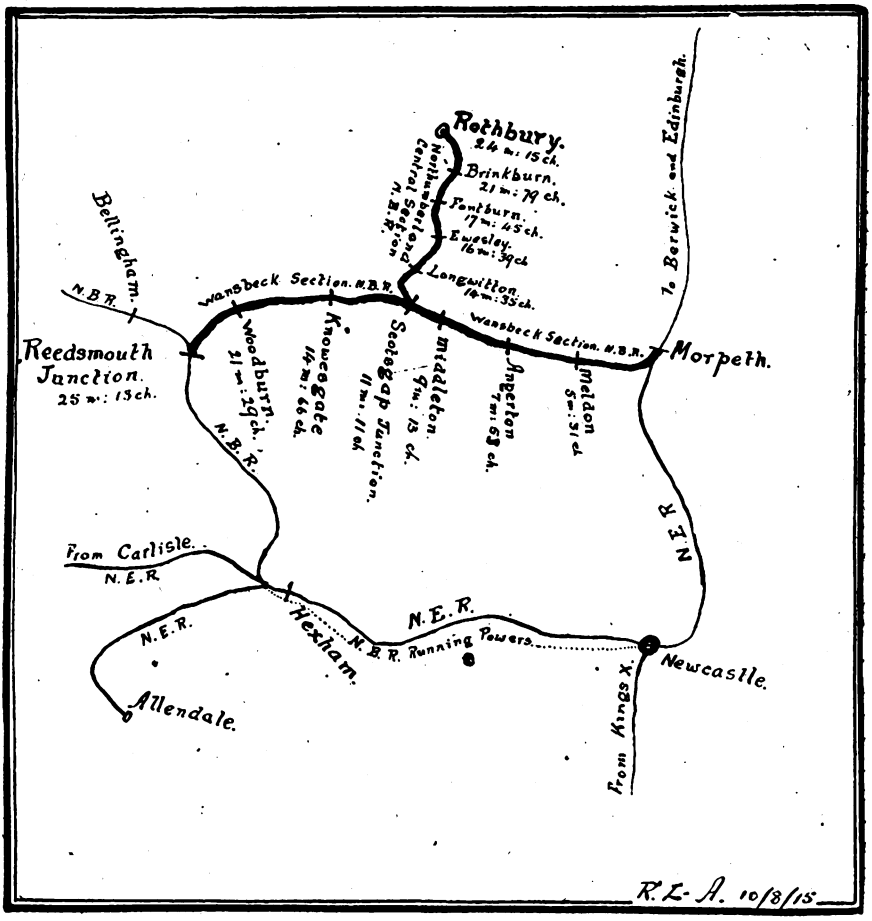
Junction (connecting with the Wansbeck line) to Rothbury (terminus) was authorised by Act of Parliament as a separate company on July 28th, 1863, and was opened on October 17th, 1870, and acquired by the North British Company by Act of Parliament in July, 1872.

The Act of 1863, referred to, authorised the creation of the Northumberland Central Railway Company and sanctioned the construction of a line 49¾ miles in length from Scotsgap, by a junction there with the Wansbeck Railway, to Cornhill, near Coldstream, on the Kelso and Berwick branch of the North Eastern Company, but 37 miles of this somewhat ambitious route between Scotland and England were abandoned by a subsequent Act of Parliament passed on April 12th, 1867, and it is not without interest to note in passing that the present North Eastern branch line from Alnwick to Coldstream, a distance of 35 miles 55 chains, apparently takes in a large part of the scheme thus abandoned, and also that the North Eastern Company in continuation of their running powers from Morpeth to Scotsgap also possess running powers from Scotsgap to Rothbury, but do not exercise them.

In the early history of the Wansbeck Railway that company appears to have used



WANSBECK AND NORTHUMBERLAND CENTRAL SECTIONS, NORTH BRITISH RAILWAY.

the Blyth and Tyne Company's station at Morpeth, but on the opening of the Upper Junction at Morpeth in May, 1872, the North Eastern Company's main line station was used, and later the old Blyth and Tyne Company's station was demolished. Readers are, of course, aware that the Blyth and Tyne Railway has now for many years formed part of the North Eastern system. The North British Company now have the use of the dock platform at Morpeth station

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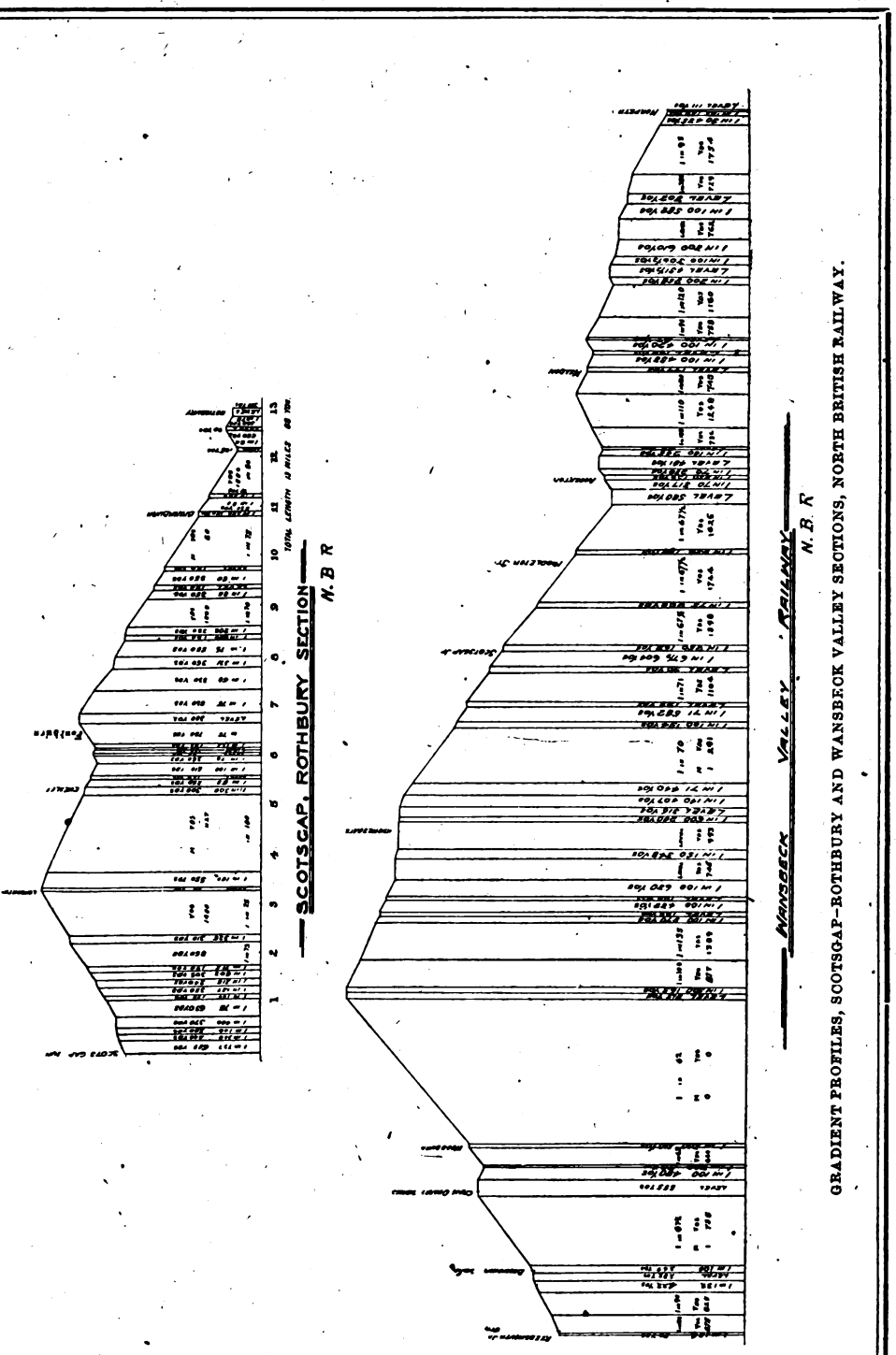

GRADIENT PROFILES, SCOTSGAP–ROTHBURY AND WANSBECK VALLEY SECTIONS, NORTH BRITISH RAILWAY.

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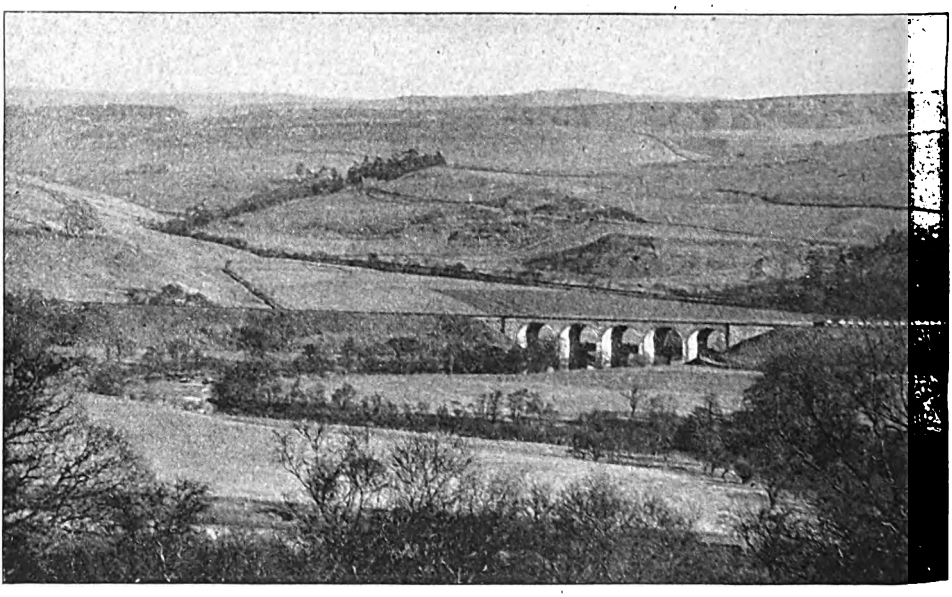
for their passenger trains by exercising running powers over the North Eastern Railway for a distance of 18 chains, and for a distance of 64 chains into the goods station. For this the North British Company pays a rent and toll to the North Eastern Company.

The train service of these two sections is very limited, owing to the sparsely populated nature of the districts traversed. For many years past three passenger trains have run daily in each direction between Rothbury and Morpeth, and three trains in each direction between Reedsmouth Junction and Scotsgap, where passengers from Reedsmouth, etc., for either Rothbury or Morpeth require to change.

result the trains from and to Rothbury are timed to connect at Morpeth with the North Eastern Newcastle trains. This arrangement in turn affects the working of the other branch train which runs only between Reedsmouth and Scotsgap and which is timed to connect with the Morpeth connections. The gradients on both sections are exceptionally severe, as will be seen from the gradient profile reproduced.

The Electric Train Tablet system is employed, several of the block sections being of considerable length, notably that from Ewesley to Rothbury, 7 miles 50 chains, and from Woodburn to Scotsgap, 10 miles 20 chains.



A VIEW OF THE REDE VALLEY, SHOWING THE VIADUCT NEAR REEDSMOUTH JUNCTION.

It is a curious fact that although these lines form part of the North British system, practically no attempt is made to give Rothbury a good connection through to the Border Counties and Waverley routes *vid* Reedsmouth, and passengers to or from Rothbury and the Waverley route *vid* Riccarton and Reedsmouth Junctions by the two available services which give a connection have a two to three hours wait at Scotsgap.

The reason given for this is that the Rothbury passenger traffic is almost entirely for Morpeth, which is the nearest market town, or through to Newcastle, changing into North Eastern trains at Morpeth. As a

Of the journey either from Morpeth or Reedsmouth to Rothbury, the impression gained of the scenery is somewhat disappointing, and though the whole of the district traversed is charged to repletion with reminiscences of Border fray and foray, the country is for the most part of a purely pastoral character. But a surprise awaits! Shortly after leaving Brinkburn station, and as the train skirts round the foot of the Simonside hills and winds along the high-up rocky cutting above the river, the view to the right hand side for the last mile or mile and a half of the journey suddenly changes in character, and the somewhat uninteresting stretches of country seen from the carriage

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windows most of the way from Morpeth or Reedsmouth give place to a glorious picture of craggy hills, densely wooded with pine and evergreens, and should the time be spring or early summer, intermingled with these is a wealth of azalea and rhododendron blossom growing in profusion among the rocks. This is the narrowest part of Lower Coquetdale—in which Rothbury is situated—and thus is the River Coquet seen to great advantage rippling by in the depths of the valley below, a picture which has delighted the eye of many an artist. And away beyond the heights of heather-covered hills—to the north of the little town—closes in the landscape, and if this should be viewed at sunset when the scene attains a certain grandeur and individuality, the unique beauty to which Rothbury justly lays claim will be at once realised.

Of the picturesque little town of Rothbury it may be said that in the Newcastle and Northumberland districts it has been somewhat generally recognised as a health resort for nearly half a century, while as a rural retreat the wonder and charm of its wild beauties has long been known and appreciated.

The population in 1911 was 1,147, and the town consists of one principal street, known as High Street, running due east and west, with Bridge Street and Church Street both towards the east end and leading to the bridge and railway station. The township is well adapted for the reception of visitors, and possesses several excellent hotels and boarding houses. The water supply is brought from Simonside hills, and a new sewerage system has recently been installed at considerable cost. In winter the climate is frequently severe, but from early spring onwards till late autumn it is very pleasant and bracing and during the most oppressively hot weather it is seldom that there is not to be felt a cool and invigorating breeze from the surrounding hills.

To the disciples of Isaac Walton the district is indeed an anglers' paradise. The Duke of Northumberland has recently leased the whole of his waters on the River Coquet, famous for yellow trout, bull trout and salmon, to the Coquet Committee of the Northumbrian Anglers' Federation, and permits to anglers are issued for short or long periods at very cheap rates. There is also an excellent 9-hole golf course, which is situated on high ground to the south of the town. This course is remarkable in many ways. The natural undulations of the grass land and the two pictureque ravines which it crosses have rendered artificial bunkers unnecessary, while considerable variety has been shown in the situation of the various greens, and in the arranging of the course every opportunity has been taken to involve the several hazards which are offered by the natural features. The site of the course is one of exceptional beauty and commands views of some of the most impressive and characteristic scenery in the Rothbury district.

The restricted train service in force has hitherto restrained the North British Railway from extensively advertising the well-merited claims of Rothbury as a summer health and residential resort, though it is hoped that after the war is over something may be done to increase the facilities for reaching the district.

To the angler who desires to spend a restful holiday and indulge in his favourite pastime; to the golfer; to the antiquarian seeking to recall the spirit of ages past in and around the ruined castles and tempest-battered towers of Coquetdale; to the tired and jaded city man anxious for a while to escape the roar of the traffic and the strife of "the madding crowd," Rothbury, with its health-giving, invigorating breezes and its lone, rugged wild beauties presents an appeal which once answered will bring one back yet again and again.

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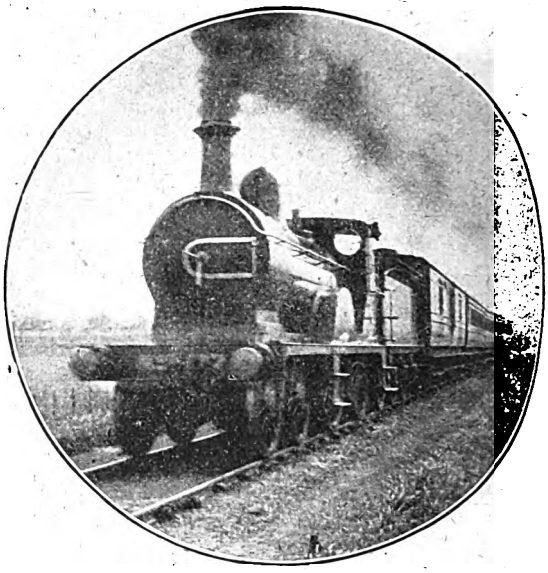
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*A. W. Willox.*

GREAT NORTH OF SCOTLAND RAILWAY.
Aberdeen Express near Elgin. 4–4–0 superheater engine No. 77 (Driver A. Davidson).

DESPITE the unfavourable conditions for locomotive construction arising out of the continuance of the war, the record of 1916 has not proved by any means barren or unfruitful in the matter of locomotive development. It is true that only one really new express locomotive has appeared during the past year—the belated four-cylinder superheater 4–6–0 of Mr. E. A. Watson's design on the Great Southern and Western Railway of Ireland, the first express engine of this wheel arrangement to make its appearance in the Emerald Isle, and in every respect a noteworthy machine. The four cylinders have a stroke of 26 in. and a diameter of 14 in., the piston valves being actuated by Walschaert's gear, placed outside the frames; driving wheels have a diameter of 6 ft. 7 in. Heating surface totals 2,212 sq. ft.—1,772 sq. ft. in the boiler and firebox and 440 sq. ft. in the superheater—and the grate area is 28 sq. ft., while the working pressure is 175 lb. per sq. in. Of the total weight of 70 tons 14 cwt., the proportion of 50 tons 14 cwt. is available for adhesion.

Of other tender types, the latest 20 superheater 4–4–0 express engines on the Caledonian Railway, of Mr. Pickersgill's design, although perhaps not revolutionary in design, embody several decided departures from M'Intosh practice. The most noticeable changes are at the front end, the new chimney and the abolition of the time-honoured "wings" of steel plate on either side of the smoke-box, together with a cutting down of the leading end of the frames, giving the new engines quite a distinctive appearance. A six-wheeled tender is also somewhat of a novelty behind a modern Caledonian express engine. In regard to dimensions, the cylinders are 20 in. diameter by 26 in. stroke, driving wheels 6 ft. 6 in. diameter, total heating surface 1,365 sq. ft. (of which 361 sq. ft. is superheating surface), grate area 21 sq. ft., and working pressure 170 lb. per sq. in. The Robinson superheater, which appears to be achieving a well-deserved popularity at the present time, is fitted to these engines. On other lines the London and North Western Railway has been investing extensively in the handy 6 ft. 3 in. 4–6–0 superheater engines of the "Prince of Wales" type, having for the first time for many decades placed an order for these engines with outside builders, and is now increasing the four-cylinder 4–6–0 "Claughton" stud by a further 10 engines.

Some powerful new tank locomotive types have made their appearance during 1916. Chief among these are the five handsome superheater 0–6–4 tanks designed by Mr. Charles Jones for the Metropolitan Railway service north of Harrow. These fine engines have 20 in. by 26 in. cylinders, 5 ft. 9 in.

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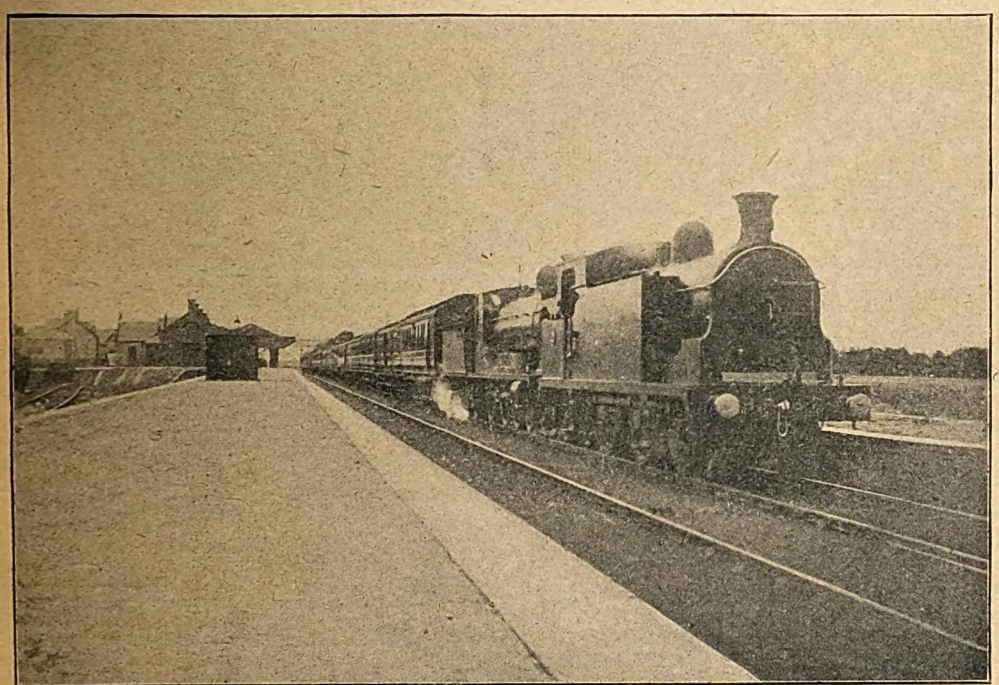
driving wheels, 1,361 sq. ft. of heating surface, of which 180 sq. ft. form the superheating surface, 21·2 sq. ft. of firegrate, and a working pressure of 160 lb. per sq. in. Of their total weight of 73 tons, 54 tons rest on the driving wheels. Another new type has been Mr. P. Drummond's 0–6–2 heavy goods tank for the Glasgow and South Western Railway, conforming to the general external lines of the 0–6–0 and 2–6–0 goods and 4–4–0 passenger engines already placed in service by that gentleman on the Glasgow and South Western Railway. These tanks have 18¼ in. by 26 in. cylinders, 5 ft. driving wheels, 1,262 sq. ft. of heating surface, 22½ sq. ft. of grate area, and 180 lb. per sq. in. pressure. Fifty tons out of their total weight of 65 tons are available for adhesion. Lastly, there are Mr. W. P. Reid's symmetrical 4–4–2 superheater tanks for the North British Railway—an enlargement of the previous series having the same wheel arrangement but no superheater. Cylinders are 19 in. diameter by 26 in. stroke, and driving wheels are 5 ft. 4 in. diameter; the superheating surface is 220 sq. ft. and the heating surface proper 1,025 sq. ft., total 1,245 sq. ft.; the grate area is 16·6 sq. ft., and the working pressure 165 lb. per sq. in. Adhesion weight is 37 tons 7 cwt. out of a total weight of 73 tons 6 cwt. As regards the immediate future, the Caledonian Railway is reported to have on order 12 large 4–6–2 tank engines, with 19½ in. by 26 in. cylinders and Robinson superheaters, while rumour credits Mr. Maunsell, of the South Eastern and Chatham Railway, with the intention of building some 2–6–4 tank engines, presumably an enlargement of the previous Wainwright 0–6–4 series.



Photo] [*Tom M. L. Neish.*

HIGHLAND RAILWAY.

Inverness–London sleeping car express at Kingussie. 4–6–0 engine of "Castle" class, assisted by 0–6–4 banking tank engine.

No new goods types have been constructed during 1916, but Mr. Hill has added to his superheater 0–6–0 stock on the Great Eastern Railway, and Mr. Gresley to his enlarged "Moguls," or 2–6–0 engines, on the Great Northern Railway. In the last-mentioned connection it is interesting to note that during the past year the last of the Midland Railway "Moguls," purchased in the United States at the time of the "locomotive famine" in 1900, has been broken up I think I am right in saying that the last of the corresponding Great Northern and Great Central types vanished some years ago, so

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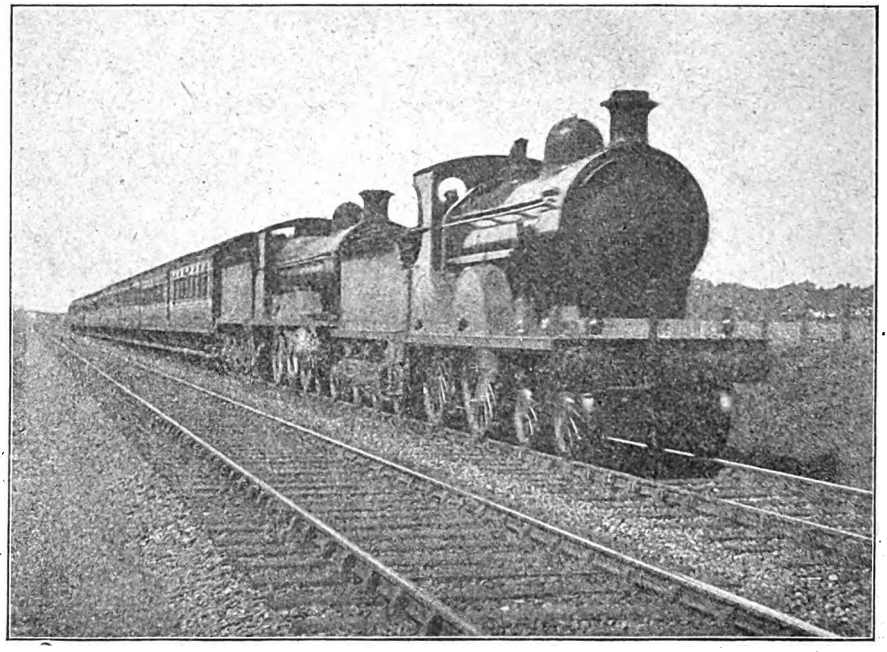
that from the standpoint of wear the experiment cannot be said to have been attended with the most successful of results. While we no longer require to purchase abroad, however, it is satisfactory to see the purchase of 50 4–6–0 locomotives by the French Government from the North British Locomotive Company a few years ago followed by the much larger order this year of 90 superheater four-cylinder compound 4–6–2 engines of the de Glehn-du Bousquet type, and 150 two-cylinder simple 2–8–0 superheater engines, for use on the French State lines. Among other interesting locomotive happenings of the past year may be mentioned the rebuilding of the 4–4–0 engine No. 11 of the Glasgow and South Western Railway—the first four-cylinder simple locomotive ever built in these islands—with a larger boiler, and the somewhat unusual conversion by the Cambrian Railways of an erstwhile 4–4–0 tank engine of the Metropolitan Railway into a 4–4–0 express engine with tender.

A significant feature of railway operation during 1916 has been the increasing employment of passenger locomotives on goods haulage. The reduction of passenger train services has, of course, released a certain proportion of the passenger engines for other duties, and their presence is thus explained, not only on continuous-braked express goods trains, or fast goods trains of Classes "A" and "B," but also on "through" goods and mineral trains, and even on "ordinary stopping" goods trains. Some of the most curious results of this practice may be seen on the Midland Railway, on account of the prevalence of piloting with heavy goods trains. I have seen a "single-wheeler" piloting a superheater 4–4–0 of Class 2, on a coal train, and, more violent still in contrast with ordinary goods train methods, an outside-framed Kirtley 0–6–0 leading one of the large 4–6–4 Tilbury tanks, some of which latter are now, I believe, stationed at Wellingborough for the purpose of hauling mineral trains between the sorting sidings there and Brent sidings, Cricklewood. Another sign of the times is the number of important inaugurations of new electrified lines that have taken place during 1916, including the extensive London and South Western Railway suburban system; the North London and London and North Western services from Broad Street to Willesden Junction and Richmond; the Lancashire and Yorkshire-Manchester and



Photo] [*J. G. Irving.*

GLASGOW AND SOUTH WESTERN RAILWAY.

9.20 a.m. Glasgow–London express near Annan. Headed by 4–4–0 and 4–6–0 locomotives.

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Bury section; and, lastly, the North Eastern Railway mineral route from Shildon to Newport marshalling yard. These extensive openings presage the increasing use of electric traction for suburban services conveying a heavy traffic with frequent stops and for goods and mineral services of considerable frequency, and there can be but little doubt that the conclusion of the war will witness the coming to fruition of further projects. But little progress seems yet to have been made in the direction of electrical operation of the intermittent and variable traffic of long-distance main lines.

We now pass to the consideration of the train service alterations of the past year. Wartime train services may be regarded from two points of view. From the locomotive aspect there has probably never been a time comparable with the present when locomotives have been called upon to exert the utmost of their tractive powers. And the result, as these columns testify from month to month, is one which does infinite credit to designers, builders, drivers and firemen alike. In this way the interest of locomotive performance has been enhanced rather than reduced by war conditions. But from the aspect of curtailed train services there is a more melancholy tale to tell, and we shall need to be prepared for even further curtailments before the opening year has proceeded far on its course. The principal express train service modifications of 1916, of course, were those occasioned by the withdrawal of restaurant cars on the Great Northern and London and North Western Railways from May 1st last. As a result of this reduction in loading, various trains were combined on the lines in question to form "multi-destination" expresses of vast weight, which have provided the locomotive departments of the lines concerned with some of the problems of haulage just referred to.

It is only when one takes stock of the vanished expresses that the extensive nature of the temporary cancellations is realised. The least affected line is probably the Great Western, which contrives to maintain practically its complete West of England and South Wales services, with the exception of the 9.10 a.m. from Bristol to Bath and London. On the Great Western Railway Birmingham route, however, the 1.0 p.m. and the 8.0 p.m. from Paddington to Wolverhampton and the corresponding up trains due at 6.55 p.m. and 10.0 p.m. are "missing," while all the remaining trains have been decelerated 10 min. in harmony with London and North Western arrangements. The Oxford and Worcester section is also affected by the withdrawal of the 8.55 a.m. from Worcester to London, and the combination of the 4.45 p.m. down non-stop with the 4.55 p.m. from Paddington to Oxford, involving a 12-min. deceleration. Among other but slightly affected lines are the London, Brighton and South Coast Railway, which loses a train or two on the Portsmouth section, but has virtually unaffected services to and from Brighton and Eastbourne, and also the Great Eastern Railway. Beyond certain slight decelerations, in the interests of coal and repair economy, the last-mentioned company's trains are practically as they were rearranged in the "radical alterations" of 1914, save that the 12.31 p.m. non-stop from Ipswich to Liverpool Street, the 5.30 p.m down Clacton and Walton non-stop, the 11.15 a.m. from Liverpool Street to Ely, and the 9.30 a.m. and 2.26 p.m. from Ely to Liverpool Street, and the continental boat trains, are for the present "suspended." The majority of these trains were innovations in the time-table referred to, and even without them the Great Eastern traveller is better off than he was with the winter services in force prior to the war.

On other Southern lines, the South Eastern and Chatham and the London and South Western—both of which have probably suffered more from military requirements than all the other English lines, with the possible exception of the London and North Western—have very reduced programmes of express trains, as compared with pre-war times. The South Eastern and Chatham time-table looks the more barren, owing to the absence of all the boat expresses, which formed so large a proportion of the crack trains to Folkestone and Dover, but the best of the remaining trains on the South Eastern section are retained, generally on their old timings, the 4.25 p.m. from Charing Cross to Folkestone now stopping instead of slipping at Ashford in the respectable time of 72 min. from Cannon Street. On the Chatham section there are one or two serious losses, notably the 9.10 a.m. "Cliftonville" and the 10.15 a.m. "Thanet" expresses from Victoria to the Kent Coast. Other trains have been substantially decelerated, the up Cliftonville putting on 10 min., while the 5.10 p.m. "City" express from Holborn Viaduct to Margate has only a stop at Faversham (instead of slipping) to account for 13 min. deceleration, and the 10.15 a.m. from Margate, although leaving Westgate 2 min.

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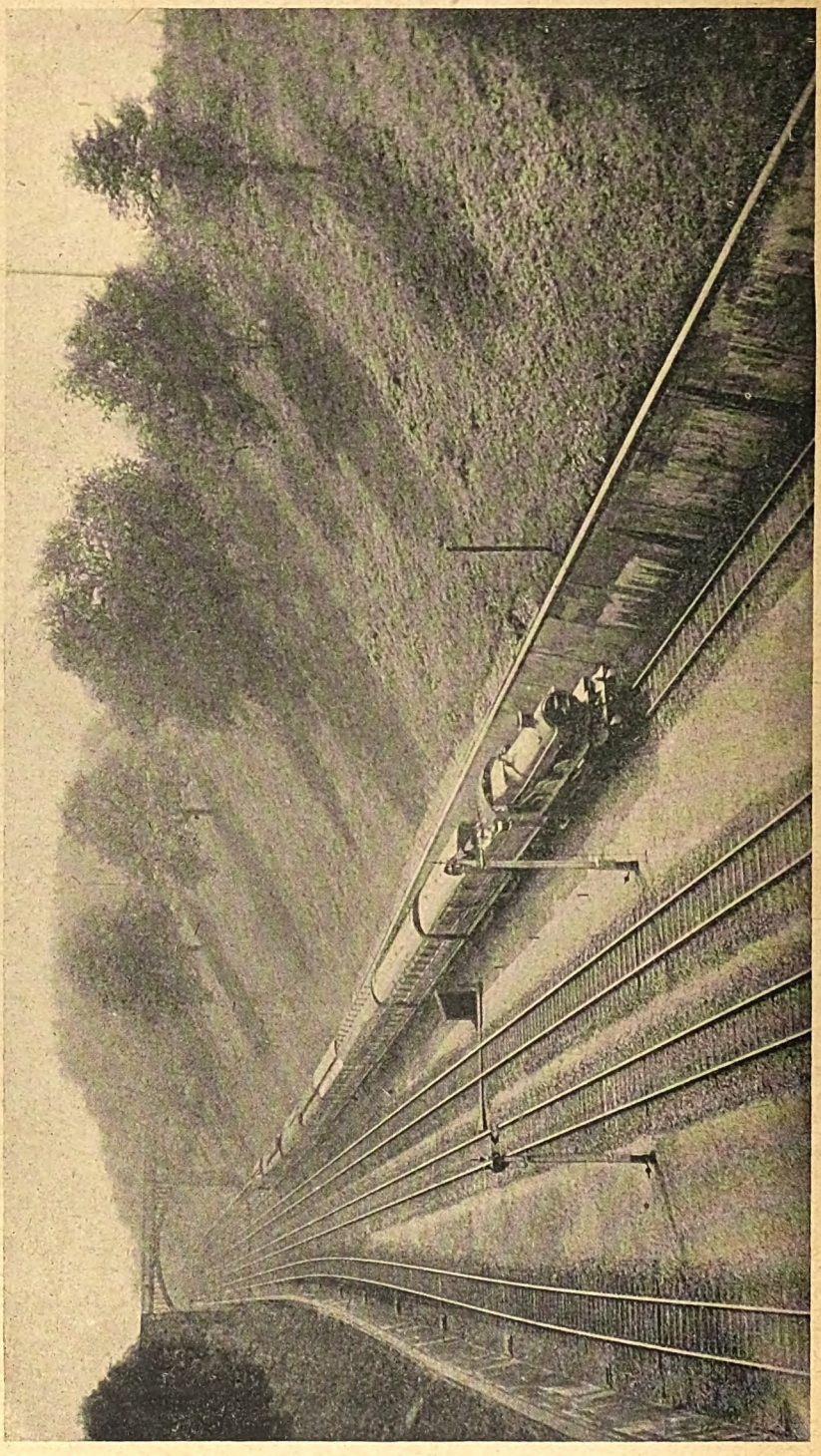

GREAT WESTERN RAILWAY.
Down express passing through Sonning Cutting.

[C. F. Deane. Photo]

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earlier and no longer stopping at Herne Hill, contrives to arrive 5 min. later than in pre-war times. The London and South Western Railway has suspended all the three Bournemouth 2-hour expresses, only the 2.0 p.m. from Waterloo, which really runs in the 2-hour times, but is allowed 6 min. extra in virtue of its Christchurch stop, now remaining. On the West of England section the 3.30 p.m. down Plymouth express starts regularly at 3.25 p.m., and calls at Woking, while of the up trains the 10.15 a.m. from Exeter calls at Yeovil Junction, Sherborne, Andover Junction and Basingstoke in addition to previous stoppages and arrives 31 min. later. The extra Surbiton stop of the 4.17 p.m. from Exeter to London, mentioned in the last issue, appears now, however, to have been deleted again.

Of the Northern companies, the Great Central is the only one to retain practically unaltered pre-war train services, the only vanished trains being the through expresses between York and Oxford and York and Bournemouth, *viâ* Banbury. Curiously enough, the cancellation of the latter in the north-bound direction has affected the principal down Great Central express—the 3.15 p.m. from Marylebone—which has thus to call at Leicester and Nottingham instead of making a non-stop run to Sheffield. But as the increased time to Manchester is only 4 min., the alteration is not a serious one, and it would not be surprising to see it made permanent. The neighbouring Midland Railway, however, has suffered as severely as any company. From the Manchester service all the fastest trains have been taken with the exception of the 12.0 noon up; in this connection a correspondent has drawn my attention to the interesting fact that the latter train is now the fastest from Manchester to London, beating its nearest rival, the 12.10 p.m. from London Road station to Euston *viâ* the London and North Western Railway, by 3 min. A run on the latter is quoted in the present issue, and of the former I hope to give a number of experiences in February or March next. The cancelled Midland Manchester trains are thus the 10 a.m. and 5.35 p.m. down, and the 10.10 a.m. and 4.15 p.m. up, but there are still three down trains left which perform the journey in under 4 hours. On the Leeds service one misses the 1.30 p.m. down Scotsman, the 3.30 p.m. and the 8.15 p.m. down—all among the best trains in the matter of intermediate times—while in the up direction the fast portion of the 1.0 p.m. from Leeds, non-stop from Rotterham, is "off," and the two up Scotch expresses due from Leeds at 6.27 and 7.18 p.m. are now merged into one train, leaving Leeds at 6.30 p.m., and reaching London at 10.35 p.m. Thus the Midland losses are indeed substantial.

The sum of the Great Northern modifications is not so serious, as by incorporating various trains much the same facilities are given us hitherto, although, of course, at the expense of a necessary increase of time. Thus the 1.30 p.m. to Leeds and the 1.40 p.m. to Harrogate now run in conjunction, while the 5.45 p.m. down Leeds, after first absorbing the 6.5 p.m. to Hull, has now itself been rolled into the 5.30 p.m. to Newcastle. In both these cases the Retford stop and the Sheffield connection have been dispensed with. Similarly, the 3.25 p.m. to York and to the West Riding and the 4.0 p.m. to Leeds have been combined, but the Sheffield connection is retained in this instance. Coming up, the 7.50 a.m. from Leeds and the 4.50 p.m. from Sheffield to London—both "crack" trains—have been cancelled, the train due in London from Hull at 1.35 p.m. has been merged into the 8.0 a.m. from Newcastle, the latter losing 15 min. in the process, and the 10.15 a.m. from Leeds has absorbed the Ripon and Harrogate express hitherto due at 2.17 p.m., this combination involving a loss of 20 min. on the part of the Leeds train. Two other substantial losses in the early days of the war were of the useful semi-fast Scottish trains leaving King's Cross for the North at 10.35 a.m. and York for London at 4.10 p.m. Similar combinations have taken place on the London and North Western Railway, the erstwhile 10.30 and 10.37 a.m. down expresses to Liverpool and Manchester and to North Wales respectively now leaving together at 10.25 a.m., the 4.0 p.m. to Manchester and the 4.5 p.m. to Liverpool being combined at 3.55 p.m., the 6.0 p.m. Liverpool and the 6.10 p.m. Manchester at 5.55 p.m., while the two down Birmingham expresses at 6.55 and 7.0 p.m. now run as one train at 6.50 p.m. The 8.40 a.m. to Birmingham and the 8.10 p.m. from Birmingham have been withdrawn, as also the 9.45 a.m. from Manchester to London, so the fastest time from London to Manchester is now 3 hrs. 51 min., and from Manchester 3 hrs. 50 min. Corresponding "junctions" have been effected in the up direction. Further than this, wholesale decelerations in running times have taken place, averaging with all the principal trains

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about 10 min. on both the Birmingham and the Lancashire services, irrespective of extra time spent in stops.

As regards the remaining lines, the changes have not been momentous. The Lancashire and Yorkshire Company has withdrawn very few trains, but all the expresses from Manchester to Southport and Blackpool have been decelerated, and the famous 40-min. time between Manchester and Liverpool has been increased to 45 min. On the North Eastern Railway the withdrawals are mainly local, main line cancellations being practically limited to one or two trains between Newcastle and Liverpool, *viâ* Harrogate and Leeds. The Caledonian Railway is running a fairly normal main line service, save for the suspension of certain trains between Edinburgh and Glasgow, in conformity with corresponding arrangements made by the North British Company. On the latter system the connecting trains to the afternoon Midland–Scottish services—the 2.15 p.m. from Edinburgh to Carlisle and the 8.2 p.m. from Carlisle to Edinburgh—disappear, but other expresses are practically unaltered. I have taken the opportunity of recapitulating all these changes, as one is sometimes tempted to under-estimate the effect of the war on our train services, whereas the cumulative effect of the cancellations and alterations is really considerable. But at the same time, this curtailment of services must have had the most valuable results in the releasing of engine power, the reduction of coal consumption and maintenance expenditure, the clearing of the main lines in order to allow of an interrupted flow of goods traffic, and other ways too numerous to mention. In the nature of things, of course, such considerations have affected mainly the South Eastern and Chatham, London and South Western, London and North Western, Midland, and Great Northern Railways, as the time-tables bear ample witness. Under all the circumstances of the present, however, we need to congratulate ourselves that such excellent facilities in every direction are still at the disposal of the traveller.

It has hitherto been my custom, in the first month's issue of a New Year, to review the best performances that I have recorded during the year just expired. Unfortunately, I have been more than usually prodigal during 1916 of accounts of exceptional runs, and I have not, therefore, so fine a collection to record as in previous years, save by referring back to some of the runs already described. For instance, on the Great Western Railway I have not had a better run during last year—and, indeed, could hardly expect to—than the one dealt with in the issue of last May on the 11.5 a.m. 2-hour express from Paddington to Bristol. On turning up that number, however, I find that, although the journey was described in some detail, no tabular statement of the times was given, and I have pleasure, therefore, in supplying the omission herewith :—

GREAT WESTERN RAILWAY 11.5 A.M., PADDINGTON-BRISTOL.

Engine: No. 4019, *Knight Templar*.
Type: 4-cylinder 4-6-0 superheater.
Load { 13 8-wheelers, 52 axles. / 398 tons tare, 420 tons full.

Miles.			Bkd. min.	Actual. m. s.	Sp'd. m.p.h.
0·0	Paddington ..	dep.	0	0.00	—
				p.w.r., 2 min.	
4·3	Acton	pass	—	8.20	—
9·1	Southall	,,	11	14.05	—
13·2	W. Drayton ..	,,	—	18.25	60
18·4	Slough	,,	20	23.15	69
24·2	Maidenhead ..	,,	23½	28.25	66
31·0	Twyford	,,	31½	34.35	65
36·0	Reading	,,	37	39.05	69
44·8	Goring	,,	—	46.50	69
53·1	Didcot	,,	53½	54.20	64
60·4	Wantage Road ..	,,	—	61.05	64
66·5	Uffington ..	,,	—	66.55	63
72·0	Mile-post 72 ..	,,	—	72.00	66
77·3	Swindon	,,	77	76.50	64
82·9	Wootton Bassett ..	,,	—	82.05	66
87·7	Dauntsey	,,	—	86.15	76
93·0	Mile-post 93 ..	,,	—	90.50	—
				sigs., 4 min.	
94·0	Chippenham ..	,,	93	93.30	19
101·9	Box	,,	—	103.10	75
106·9	Bath (slack and slip)	,,	105	108.15	30
111·3	Saltford	,,	—	113.20	70
116·7	St. Anne's Park ..	,,	—	118.20	—
				sigs., 1 min.	
118·4	Bristol	arr.	120	122.00	—
118·4	net time (min.) ..		120	115	

These times speak for themselves. The engine that can maintain for 8 miles on a dead level track a speed of 69 m.p.h., with a load of 420 tons behind the tender, or can cover 84 practically level miles with the same load at an *average* rate of 65·7 m.p.h., as did *Knight Templar* on this occasion, is more than equal to the hardest tasks that any time-table can produce in this country.

As regards the London and North Western Railway, probably my best run of the year was again one which has already appeared in print—the journey on the 5.20 p.m. from Liverpool to Euston that was described in the RAILWAY MAGAZINE for October last.

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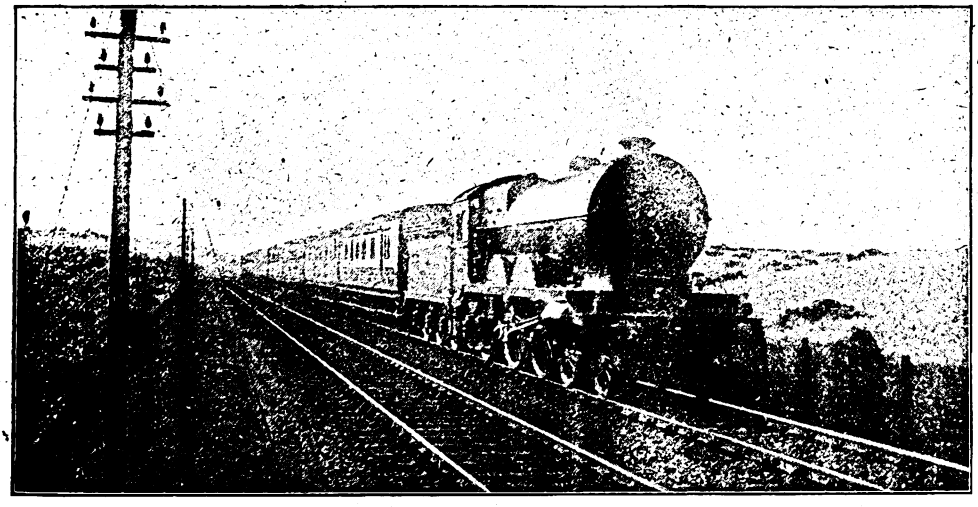
This was, moreover, a case of loading comparable with that of the Great Western trip just cited, the load of the London and North Western train totalling 14 eight-wheelers, almost entirely modern 57 ft. stock, weighing 406 tons empty and 425 tons with passengers and luggage, while the engine was a 4–6–0 "Prince," No. 505, *Onyx*. Details of the run were given at length in the article mentioned, but the fact may be recapitulated that the 70¾ miles' journey from Stafford to Blisworth, inclusive of the usual Rugby slack, was completed in 75½ min., start-to-stop, the continuation of 57⅜ miles from Blisworth to Willesden occupying 60 min. 25 sec., also start-to-stop. Adding the two successive economies on schedule of 4½ and 1½ min., the 1.19 p.m. express from Stoke to Willesden, which, with its allowance of 148 min. only for the 140½ miles' non-stop journey (averaging 57 m.p.h.), is probably now the fastest booked train on the London and North Western line. The early stages of the journey from Manchester were interesting, in that we were, according to custom, hauled by a North Staffordshire Railway locomotive from London Road to Stoke; on this occasion the engine was one of the late Mr. J. H. Adams' fine 4–4–2 superheater tanks, No. 55, and the load one of twelve modern corridor 8-wheelers, weighing empty 351 tons, and full 370 tons. From Manchester to Stockport there is an almost impossible booking, for such a load, of 9 min.



Photo] [*Tom M. L. Neish.*

NORTH BRITISH RAILWAY.

1.20 p.m. Aberdeen–London express near St. Fort. 4–4–2 locomotive No. 874, *Dunedin*. Next the engine is a through Great North of Scotland bogie coach running between Elgin and Edinburgh (Waverley).

the engine had thus gained in all 6 min. between Stafford and Willesden—a fine feat for a locomotive of such comparatively moderate dimensions, weighing only 66·3 tons, and pulling 6·4 times its own weight. The Great Western engine whose work is mentioned above, and was undoubtedly superior even to this, weighs 75·6 tons, and was therefore hauling 5·6 times its own weight, in addition to enjoying a nominal tractive effort greater by 20 per cent.

Quite recently, however, I have been fortunate in securing a record of some fine London and North Western work, under much less onerous conditions of loading, on for the 6 miles, start-to-stop, and there is still less incentive to hurry now that no through coaches from the Lancashire and Yorkshire system are being attached at Stockport, and that an allowance of 6 min. there is consequently excessive. So this initial length took us 10½ min. Re-starting, we passed Cheadle Hulme, 2·3 miles, at reduced speed in 4 min 50 sec., climbed the succeeding 2·9 miles (almost entirely at 1 in 191–192) to Poynton in 4 min. 35 sec., with a sustained speed of 44 m.p.h., touched 48 on the very brief strip of level beyond Adlington, passed Prestbury, 9·3 miles, in 14 min. 55 sec., and reached Macclesfield, 11·7 miles, in 18 min. 25 sec. This was excellent work, as the rise

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is quite steep almost throughout, although the booking is only 18 min.

From Macclesfield we were banked in rear, as usual, up the ascent for 2·1 miles from the Central station to Macclesfield Moss Box (the major part of which is at 1 in 102), and thus passed the latter, 2·4 miles from Hibel Road, in the good time of 5 min. 40 sec., the sustained speed on the steeper part of the ascent being 30 m.p.h. exactly. On topping the summit we went rather more moderately than usual down the tempting descent to Congleton, only touching 59 m.p.h. on the first 3¼ miles at 1 in 176 to North Rode Viaduct, falling to 56 on the mile up at 1 in 330 beyond, and reaching 58 on the 1¼ miles at 1 in 264 to Congleton Viaduct. The level stretch thence to Harecastle reduced the speed to 50 m.p.h., but on the 1 in 330 down to the tunnel we touched 55; in the tunnel, which is level, the speed fell to 51, and we then again accelerated to 56 on the 1 in 330–316 to Etruria, before and after which station we were badly slacked for signals. However, the journey of 19·8 miles from Macclesfield to Stoke was completed in 27 min. 40 sec., or in 40 sec. over schedule, and in about 26½ min. net, the 11·3 miles from Macclesfield Moss to Harecastle taking 13 min. 10 sec., and the 5 miles thence to Etruria 5 min. 55 sec. Such was really good work for a tank engine with 6 ft. wheels, although I recorded in these columns in 1914 even better running with the same engine and train, and a slightly heavier load. I hope to tabulate all these journeys ere long, together with a considerable number on the 8.30 a.m. North Western-hauled express from Manchester to Stoke, by way of comparison.

But to resume: at Stoke No. 55 came off, and was replaced by a superheater London and North Western 4–4–0, No. 1730, *Snipe*, while the load was reduced to the eminently manageable figure of eight corridor 8-wheelers, 232 tons empty and 245 tons with passengers and luggage. From the very start it was evident, as the tabulated details show, that we were in for some exceptional running, as we got away over the North Stafford line to Colwich at really tremendous speed. The line falls gradually from Stoke to Trentham, and after that 1 in 330 for 6½ miles (with slight breaks), followed by faintly falling grades for another 5¾ miles. On the first-mentioned length we ran freely at 77½ m.p.h., covering the 14·6 miles from Barlaston to Haywood in 12 min. 35 sec., at an average of all but 70 m.p.h., and

LONDON AND NORTH WESTERN RAILWAY 1.19 P.M., STOKE–WILLESDEN.

Engine: No. 1730, *Snipe*.
Type: 4–4–0 superheater.
Load { 8 8-wheelers, 32 axles.
232 tons tare, 245 tons full.

Miles.			Bkd. min.	Actual. m. s.	Sp'd. m.p.h.
0	Stoke	dep.	0	0.00	—
7	Stone Junction	pass	—	9.10	71½
14	Weston	„	—	14.50	77½
18¾	Colwich (slack)	„	22	19.25	25
21⅝	Rugeley	„	—	22.50	62
				sigs.	40
29⅝	Lichfield	„	—	31.05	—
				p.w.r.	10
35⅞	Tamworth	„	40	39.55	58
39⅜	Polesworth	„	—	43.20	62½
43⅝	Atherstone	„	—	47.25	61
					70
48⅞	Nuneaton (signals)	„	53	52.45	45
52½	Bulkington	„	—	57.15	51
57⅞	Brinklow	„	—	62.50	†70
63⅜	Rugby (slack)	„	69	67.55	45
70⅝	Welton	„	—	76.30	*53
76⅛	Weedon	„	—	81.25	73
83½	Blisworth	„	—	87.15	71½
86	Roade	„	92	89.55	64
91⅛	Castlethorpe	„	—	94.05	77½
93½	Wolverton	„	—	95.55	64
99½	Bletchley	„	106	101.00	65
105¾	Leighton	„	—	107.20	—
114½	Tring	„	122	117.35	—
128⅜	Watford	„	136	133.35	—
134½	Harrow	„	—	140.05	—
140½	Willesden Junction	arr.	148	146.30	—

† At the troughs. * On entering Kilsby Tunnel.

thus gaining over 2½ min. on schedule on the first stage to Colwich! At the latter junction we slacked carefully, and had just "got going" again nicely when there came the bad Lichfield checks. That before the station was in the nature of a warning for the very bad bridge repairing slack beyond. Notwithstanding this, we were doing 62½ m.p.h. on the level beyond Tamworth, and went up the rising grades to Atherstone, finishing at 1 in 330, with no lower speed than 61 m.p.h., while on the faintly falling 2½ miles beyond Atherstone we touched 70. Then came the third check, this time by adverse signals, but it is noticeable that, all checks included, we were still ahead of time, on even so fast a booking as this.

There now followed the culminating effort of the run, as, although passing Nuneaton at low speed, we yet gained 4¾ min. from there to Bletchley. Up the 3½ miles at 1 in 330 to Bulkington we rose in speed to 51 m.p.h., while on the brief 1 in 330 descent beyond Brinklow we touched 70. Slacking through Rugby, we accelerated up the 5 miles at 1 in 364 to Kilsby Tunnel to 53 m.p.h., and

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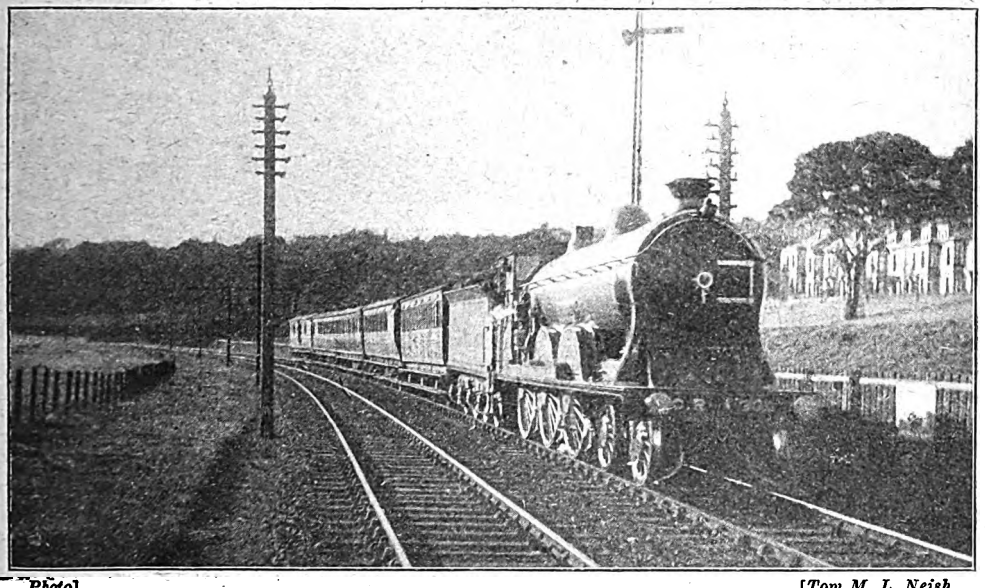
then, despite the modest character of the descent to Weedon—2 miles at 1 in 340 and 3 at 1 in 406—we ran for a considerable distance at 73 m.p.h. So "hot" was the pace here that, although from Weedon to Blisworth the line is mostly on faintly ascending grades, we were still doing 71½ m.p.h. at the latter station, and forged up the 2½ miles at 1 in 326 to Roade with no lower rate than 64. Then followed a "hurricane" descent to Castlethorpe troughs, with a sustained speed of 77½ m.p.h. on the 1 in 330. Thus it is not surprising that these times as between Welton and Wolverton—22⅞ miles in 19 min. 25 sec., averaging 70·2 m.p.h.—carry off all my records between these points. But we were now getting so very much ahead of time that a "pronounced" easing of the engine was not unexpected. So the speed had fallen to 64 m.p.h. as we passed Wolverton, and, although maintained between 63 and 65 until passing Bletchley, we were only doing 58 at Leighton, 48 at Cheddington, and actually 41 at Tring! Furthermore, we ambled down from Tring to Watford at a steady and unvarying 56 m.p.h.! By the aid of this ultra-easy running we reached Willesden only 1½ min. before time, but, even then, with a smart stop, and a 9¾ min. run into the terminus, we contrived to arrive 3¼ min. before we were due.

It is hard to estimate a net time for this run. Had we merely kept strict time from Colwich to Nuneaton and from Bletchley to Willesden the 140½ miles' run from Stoke to Willesden would have been performed in 140 min. 40 sec., in virtue of the gain of 2 min. 35 sec. from Stoke to Colwich, and 4 min. 45 sec. from Nuneaton to Bletchley. But the Lichfield and Nuneaton delays, three in number and one to 10 m.p.h., must have cost us at least 4¾ to 5 min., while on my record run from Wilmslow to Euston by the morning Manchester express, detailed in January, 1914, with running as far as Bletchley slightly inferior to that of the run now under discussion, *Percy Bysshe Shelley* (a 4–6–0 "Prince") ran on to Willesden in 8 min. 35 sec. less than the time of this run. Allowing for the delays on the basis of the actual running, and allowing for work from Bletchley forward to Willesden as fast as that of the previous journey just mentioned—of which *Snipe*, on such "form," must have been perfectly easily capable—the net time for the 140½ miles from Stoke to Willesden would work out at something like 134 min. for the 140½ miles' journey, start-to-stop. Such enterprising running is indeed refreshing in times like these, although I ought to say that I made no communication to the driver either before or after the run, and am not, indeed, aware of his name,



Photo] [*Tom M. L. Neish.*

CALEDONIAN RAILWAY.

4.10 p.m. train *ex*-Perth near Buckingham Junction. 4–6–0 locomotive (6 ft. 6 in. class) No. 906.

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being obliged to hurry away on arrival at Euston.

Next on my list comes my best Midland journey, which, although not perhaps phenomenal in character, was certainly a very fine example of what the Midland compounds can do. The run in question was made on the 3.4 p.m. express from Nottingham to St. Pancras, which, since the withdrawal of the fast portion of the 1.0 p.m. from Leeds, non-stop from Rotherham to London, has loaded much more heavily, and must in very truth be one of the most difficult Midland trains to work to time. On this occasion the "diners" were, as usual, detached at Nottingham, and we left for the south with nine 8-wheelers, weighing empty

MIDLAND RAILWAY 3.3. P.M., NOTTINGHAM–ST. PANCRAS.

Engine: No. 1021, compound 4-4-0.
Load { 9 8-wheelers, 36 axles. / 228 tons tare, 240 tons full.

Miles			Bkd. min.	Actual. m. s.	Sp'd. m.p.h.
0	Nottingham ..	.. dep.	0	0.00	—
2¾	Edwalton ..	.. pass	—	5.25	44½
8¼	Widmerpool ..	.. ,,	—	12.10	48
14¼	Grimston ..	.. ,,	—	18.50	58
18¼	Melton ..	arr.	23	23.10	—
0		dep.	0	0.00	—
3¾	Saxby	.. pass	—	6.20	51
				sigs.	55½
8¼	Ashwell ..	.. ,,	—	12.15	30
11¼	Oakham ..	.. ,,	—	16.30	—
15	Manton ..	.. ,,	17	20.00	67
20¼	Harringworth ..	.. ,,	—	24.40	72½
25¾	Weldon ..	.. ,,	—	31.00	48
28¼	Geddington ..	.. ,,	—	33.55	62½
33¼	Kettering ..	arr.	38	39.30	—
0		dep.	0	0.00	—
				slack	40
2¾	Isham	.. pass	—	4.30	—
7	Wellingborough	.. ,,	8	8.45	66
12¼	Sharnbrook Summit ..	,,	—	14.40	46
15¼	Sharnbrook ..	.. ,,	—	17.35	79
22¼	Bedford ..	.. ,,	23	23.35	69
30¼	Ampthill ..	.. ,,	—	31.45	51
31¾	Flitwick ..	.. ,,	—	33.30	57½
34¾	Harlington ..	.. ,,	—	36.45	—
39¼	Leagrave ..	.. ,,	—	42.00	49½
41¾	Luton	.. ,,	44	44.30	—
44¾	Chiltern Green	.. ,,	—	47.20	68
47¼	Harpenden ..	.. ,,	—	49.45	66
52	St. Albans ..	.. ,,	54	54.10	—
56¾	Radlett ..	.. ,,	—	57.55	79
59½	Elstree ..	.. ,,	—	60.30	59
64¼	Hendon ..	.. ,,	—	65.20	69
68¼	Finchley Road	.. ,,	—	68.40	—
70½	Kentish Town	.. ,,	72	70.55	—
72	St. Pancras ..	.. arr.	76	73.55	—

228 tons (one of the vehicles was non-corridor) and full 240 tons; the engine was No. 1021, a 4-cylinder compound very ably handled by Robinson, of Trafford Park shed. Magnificent work was done on the rising grades out of Nottingham; at Edwalton, after ⅝-mile at 1 in 330 and 1⅝ at 1 in 200, we were doing 44½ m.p.h.; the 4 miles at 1 in 200 up to Widmerpool were begun at 49½ and ended at 48½ m.p.h.; the easier grades ascending to Upper Broughton raised the speed to 52 m.p.h.; and the ¾-mile descent at 1 in 284 past the latter station to 58 m.p.h. Then we descended briskly to Melton Junction with a maximum of 70 m.p.h., the time of 23 min. 10 sec. to Melton, start-to-stop, being of the very first water, over such a road. On the next stretch, unfortunately, we were badly delayed by signals at Ashwell, after attaining the splendid rate of 55½ m.p.h. up almost continuously rising grades, 5 miles of which are at 1 in 282–293. After that we did not do more than 67 m.p.h. at Manton and 72½ at Harringworth Viaduct, while we also fell, perhaps a little disappointingly, to 48½ m.p.h. on the 5¼ miles at 1 in 200 up to Weldon. So with a cautious descent to Kettering, the 33¼ miles from Melton to Kettering took 39½ min., or 1½ min. overtime, but the net time did not exceed about 37 or 37½ min.

But from Kettering the running was almost flawless. Slacking carefully over Kettering South Junction cross-over, we were, nevertheless, through Wellingborough in 8¾ min., travelling at 66 m.p.h., and then went right up the 4¼ miles of Irchester bank —¾ at 1 in 163, ⅞ at 1 in 192, and 2⅝ at 1 in 120—with no lower rate than 46 m.p.h. Brisk speed was made down Sharnbrook bank, with a maximum of 79 m.p.h., and although the rate was eased to 61 over Oakley troughs, we were again doing 69 on passing Bedford. Seven miles' climbing to Ampthill, of which 5 average 1 in 200, reduced our rate to 51 m.p.h., and after a brief acceleration to 58 on the descending ½-mile to Flitwick, the remaining 6½ miles at 1 in 202 up to Toddington summit only brought the speed down to 49½ m.p.h., with the result that the 19½ miles from Bedford up to Luton were covered in 20 min. 55 sec. The fluctuating and invariably high speeds beyond this point are clearly indicated in the table, and it was not until we were past Mill Hill that the engine was eased, steam being shut off from there to Hendon, so that we did not run faster here than 69 m.p.h. Nevertheless, with a rapid finish into St. Pancras, we contrived to stop in the terminus in 73 min. 55 sec. from Kettering, 72 miles, having gained over 2 min. on the

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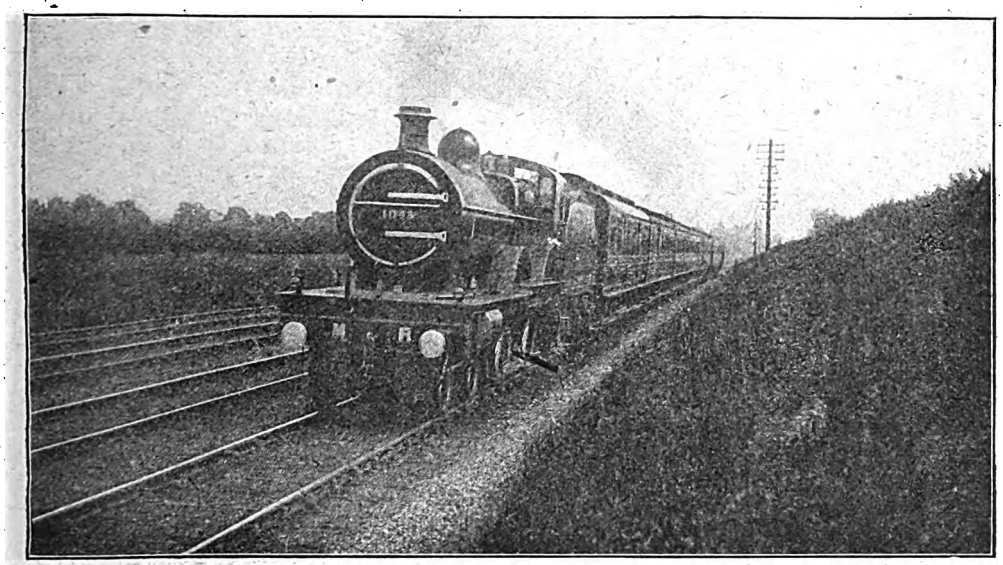
exceedingly fast timing between these points, after a very fine run indeed.

My Great Central "best" of 1916 was undoubtedly Bailey's exploit with No. 432, *Sir Edward Fraser*, when with 175 tons he continued to cover the 45·7 miles from High Wycombe to Woodford in 43 min. 55 sec., or 43¼ min. net, thereby gaining 5¾ min. on booked time. But this feat was fully described and tabulated in the RAILWAY MAGAZINE of May last, and space does not permit of any further reference to it. In, conclusion, however, I wish to refer to a couple of runs on the Liverpool–Manchester service of the Cheshire Lines Committee, which, of course, is operated with engine power furnished by the Great Central Company, these runs decidedly coming within the category of exceptional work in view of their abnormal loads. The train in both cases was the 9.30 p.m. *ex*-Liverpool, booked, as usual, to Warrington, 18·4 miles, in 23 min., and thence to Manchester, 15·7 miles, in 20 min., over a sharply undulating road. With a load of five or six 8-wheelers these times may—and do—present no difficulties, but when four or five further bogie vans or extra vehicles of other sorts are added, the problem becomes an altogether more serious one. So it was on these two occasions (and, I believe, regularly with this train), No. 1022, a large 4–4–0 of the "Sir Alexander" class, non-superheater, having on the first run to tackle a load of ten bogies, or 280 tons full, while on the second journey No. 872, one of the small 4–4–0's now superheated, had nine bogies and a six-wheeler.

There is not an easy start from Liverpool, the journey commencing as it does with ·4 mile up at 1 in 109 through the tunnel to St. James' station, but the short 1 in 150 down beyond, of the same length, somewhat redresses the balance. Despite the subsequent mile up at 1 in 200 to St. Michaels, and nothing easier than 1 in 750 down beyond, No. 1022 was doing 52½ m.p.h. when we passed Mersey Road, and then went up the 3-mile rise to Hunt's Cross, of which the last 1½ are at 1 in 195, with no lower rate than 47½ m.p.h. The 2¼ miles down past Halewood produced a maximum of 68 m.p.h., and the 2¼ miles up at the same inclination to Farnworth only brought the speed down to 56 m.p.h., while the descending stretch thence to Sankey, partly at 1 in 188–200, raised the speed to a sustained 70 m.p.h. So Warrington was reached in just under the booked time allowance. We got away well from Warrington, touching 56 m.p.h. beyond Padgate, but falling to 51½ on the 2 miles at 1 in 240–200 to Risley siding; on the easy grades thence to Glazebrook we reached 58½ m.p.h., while the minimum speed at the Ship Canal bridge, after all but a mile up at 1



Photo] [*C. W. Tidmas.*

MIDLAND RAILWAY.

9.30 a.m. Anglo-Scottish express. 4–4–0 compound locomotive No. 1043.

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CHESHIRE LINES COMMITTEE, LIVERPOOL–MANCHESTER.

G.C. Engine, No.	1022	872
Type:	4-4-0†	4-4-0‡
Load (axles)	40	38
,, (tons)	280	265

Miles		Bkd. min.	Actual. m. s.	Act'l. m.p.h.
0·0	Liverpool (Central) .. dep.	0	0.00	0·00
0·8	St. James .. .. pass	—	2.45	2·40
2·6	St. Michaels .. .. ,,	—	5.30	5·25
4·0	Mersey Road .. ,,	—	7.15	7·10
7·1	Hunt's Cross .. ,,	—	10.55	10·50
8·4	Halewood .. .. ,,	—	12.25	12·25
12·3	Farnworth .. .. ,,	—	16.05	16·15
15·8	Sankey .. .. ,,	—	19.30	19·45
17·3	Sankey Junction .. ,,	—	20.50	21·10
18·4	Warrington arr.	23	22.45	23·10
0·0	Warrington dep.	0	0.00	0·00
1·8	Padgate .. .. pass	—	4.00	3·55
6·1	Glazebrook .. .. ,,	—	8.45	8·55
8·4	Ship Canal .. .. ,,	—	11.15	11·30
10·7	Urmston .. .. ,,	—	13.30	13·45
12·5	Trafford Park .. ,,	—	15.20	15·35
15·7	Manchester (Central) arr.	20	19.50	20·10

† Large-boilered. ‡ Small-boilered, superheater.

in 135, was 52 m.p.h. From there we ran briskly down the corresponding grade to Flixton, accelerating to 64 m.p.h., and continued to run well until well within the suburbs of Manchester, the speed at Throstle Nest Junction being exactly 60 m.p.h. So, on the second stage also, a few seconds were pared off the tight time allowance.

The smaller engine, No. 872, with a fractionally lighter load, did very well indeed to tie exactly with No. 1022's times to Halewood, but thereafter the speeds were slightly lower, being 66 m.p.h. beyond Halewood, 53½ at Farnworth, and 69 at Sankey. Similarly, beyond Warrington, No. 872 got away fractionally faster, but with speeds of 50 m.p.h. at Risley, 57 at Glazebrook, 51 at the Ship Canal, 64 at Flixton, and 55 at Throstle Nest, our second journey took 20 sec. longer than the first. The aggregate running of No. 872 was thus only ¾-min. behind that of No. 1022, and in both cases the performance was in the highest degree creditable. On most other runs that I have timed with this load 2 min. have been dropped on each of the two stages of the journey. Considerations of space prevent me from describing further runs, but I hope to deal with some good Great Eastern journeys in the next issue, while for my best Great Northern journeys of the past year I would refer the reader to the RAILWAY MAGAZINE of October last, when some very fine journeys on the 1.30 and 5.30 p.m. expresses from King's Cross were described in detail.

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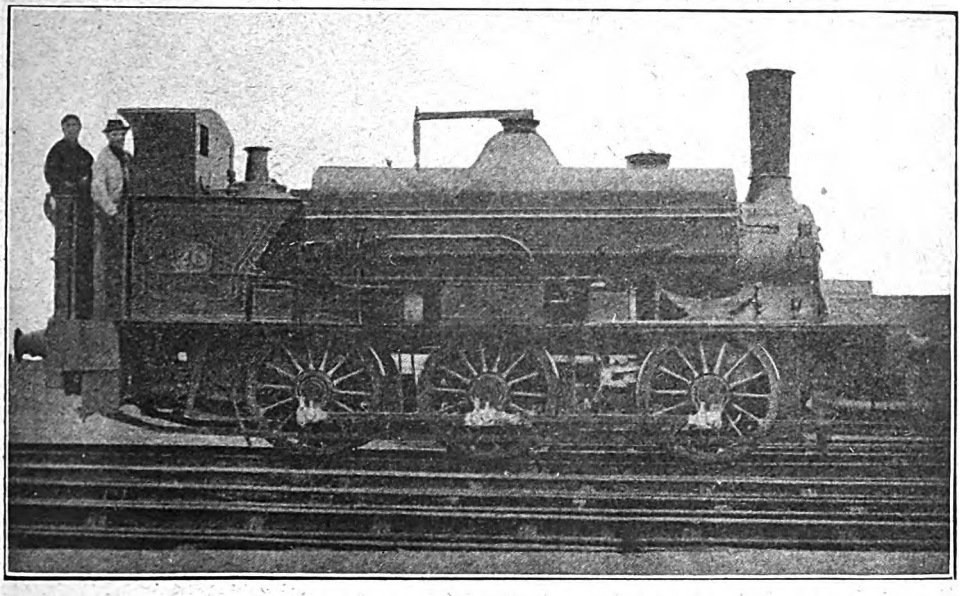
Locomotive and Train Working in the latter part of the 19th Century.

NORTH EASTERN RAILWAY. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 400, *December* RAILWAY MAGAZINE.)

THE six-coupled shunting engines of the period were marvels of angularity. Most of them had all the wheels in front of the firebox, and square shaped saddle, or as the Great Western prefers to call them: "pannier" tanks. One of this type, No. 20, which, by the way, was a northern division and not a York engine, is shown above. There were, however, a few of them, such as Nos. 345 and 349, at York which had a more respectable appearance, in that they had been rebuilt with the trailing wheels behind the firebox and with round topped saddle tanks of a rather neater design.



0–6–0 SADDLE TANK SHUNTING ENGINE, NO. 20. BUILT AT GATESHEAD, 1869.

Some other York passenger engines will be mentioned later in dealing with the train services on other lines radiating from that centre.

An important line which branches from the York and Scarborough Railway at Rillington Junction is that to Whitby. The coaches formerly used over this section were always four-wheeled, on account of the numerous curves between Grosmont and Pickering. Even the Great Northern had to run through four-wheeled coaches on their trains from King's Cross in order to provide for the summer seaside traffic to Whitby. On the North Eastern these coaches were jocularly referred to as the "Whitby bathing machines." I never had the pleasure of riding in one of them on the Great Northern, but I can imagine that the passengers felt their movements, especially at the high speeds of the express trains between London and York. The engines used by the North Eastern were also of a special class, known as the "Whitby bogies." They were 4–4–0 engines with double frames for the coupled

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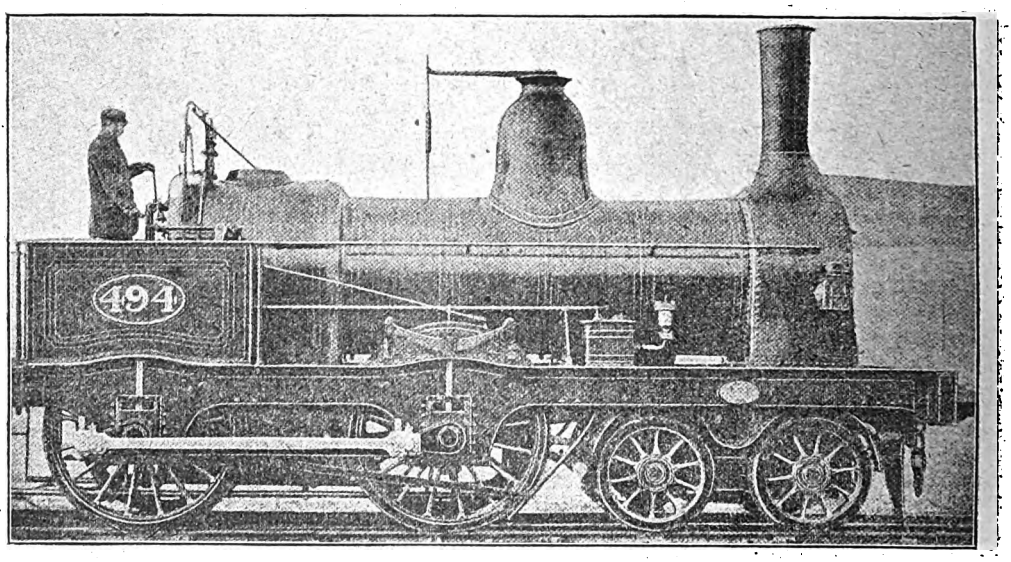
wheels, which had a diameter of 5 ft. Cylinders were 16 in. by 22 in. These engines were numbered 492 to 501, and came out in 1864–5 from the works of Messrs. Stephenson, when they presented the appearance of engine 494, below. The Whitby bogies lasted on the road for about 30 years, when they were replaced on this section by some of McDonnell's later 6 ft. 6 in. bogie engines.

Leaving the York division for the time and passing on to Hull, the trains from that port may be divided into two distinct sets: (1) the "main line" trains to Leeds and to Doncaster and (2) the coast trains to Scarborough, together with those on the Withernsea and Hornsea branches. The "main line" service also included some trains to



NO. 494 (SERIES 492–501) "WHITBY" BOGIE ENGINE, BUILT BY STEPHENSON & CO., 1864–5.
Coupled wheels, 5 ft. Cylinders, 16 in. by 22 in.

York *viâ* Gascoigne Wood Junction and Church Fenton, and I think there was one Normanton train which connected with the Midland mail train between Newcastle and Bristol. The Hull and Leeds service, though it served two extremely important towns, was not inspiring from the speed point of view. The best train in 1880 from Hull to Leeds left the former town at 9.10 a.m., and reached Leeds, 51¾ miles, at 10.45 a.m., with stops at Brough, Selby, and the inevitable ticket-collecting stop at Leeds (Marsh Lane). In the opposite direction, the 10.50 a.m. from Leeds arrived at Hull at 12.15, with stops at Marsh Lane and Selby. It took 34 min. for the 20-mile run from Marsh Lane to Selby, and 48 min. for the run from Selby to Hull—30¾ miles—a time allowance which included the ticket platform stop at Hull. By 1883 there had been a slight improvement, for Foxwell records three trains between the two towns which averaged 1 hr. 18 min.

Engines at Hull were nearly as variegated as those at York. Most of the single engines which did not belong to York were quartered at Hull. There were seven single engines of five totally different classes. Of these, three 6 ft. 6 in. "singles," Nos. 77, 190, and 159, were employed almost exclusively on the Leeds road, for the expresses. Nos. 77 and 190 were sister engines, and had been reconstructed at York, the first from the original Stephenson three-cylinder engine, and the second from another Stephenson design with outside valve gear. The reconstruction had been so complete that there was nothing at all left of the originals. They had inside frames only to the driving wheels and outside frames to the carrying wheels, and had a distinct family likeness to Mr. Stirling's Great Northern "singles" 39, 4, etc., though somewhat smaller, for the two North Eastern engines had only 16 in. by 20 in. cylinders. No. 159, afterwards renumbered 1709, was of a somewhat similar style, but not of the same class, and had a 22-in. stroke. The illustration of 1709 shows this engine after a McDonnell chimney had been added and a closed plate substituted for the pattern of cut-out ovals in the driving splashers. No.

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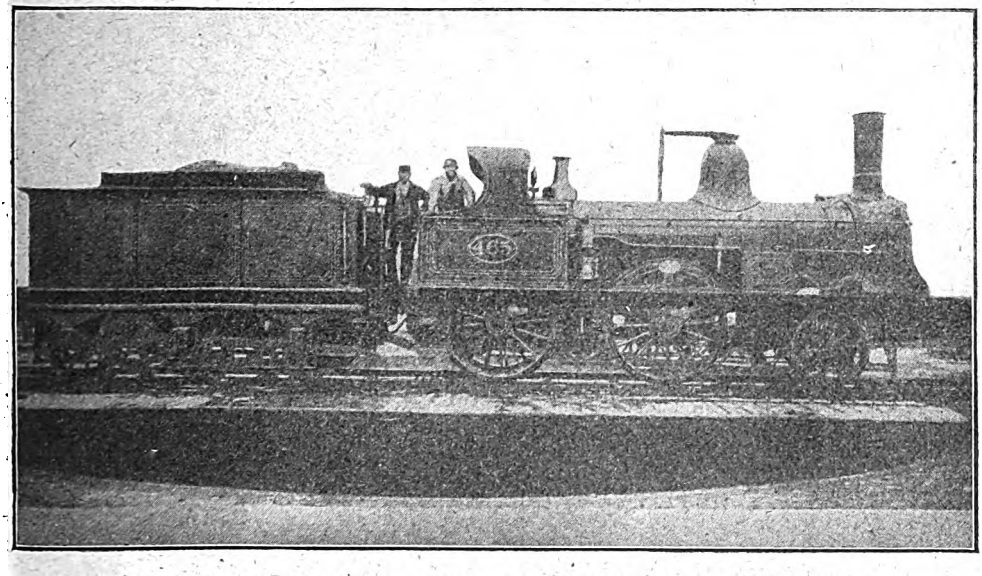
159 was broken up, but 77 and 190 survive as single side tank engines of the 2–2–4 type, the former now being No. 1679. They are used for official saloons, etc.

The other four singles at Hull ran on the Doncaster trains, but were frequently on certain stopping services to Leeds. They consisted of No. 180, a 6 ft. 6 in. double-framed engine, a rebuild of the well-known York, Newcastle and Berwick engine "Plews." This had originally had 7 ft. wheels, and was built by Messrs. Hawthorn in 1848. In its last days at Hull, however, its appearance had been considerably altered from the original design.

Two other engines, Nos. 27 and 212, were enlarged "Jenny Linds" with 6 ft. 3 in. drivers and 16 in. by 20 in. cylinders. They dated from E. B. Wilson's works at Leeds in 1853, but though nominally of the same class, they bore little outward resemblance to each other, for 212 had been altered and the splashers had two large apertures with brass beading in place of the well-known Wilson oval slots which engine 27 retained. Finally, there was No. 223, a double-framed Stephenson, rebuilt with a Gateshead flush boiler; the wheels of this engine had been reduced from 6 ft. 6 in. to, I believe, 6 ft. in. diameter, and the cylinders were 16 in. by 20 in. In the Leeds train link there were also three 2–4–0 6 ft. 6 in. coupled engines with double frames of the 25 class, Nos. 102, 148, and 468, which took their turns with the three 6 ft. 6 in. singles 77, 190 and 159, as also did engine 544, a 6 ft. 6 in. mixed framed Hawthorn which had been rebuilt at York similarly to 551, previously mentioned.

The Hull and Doncaster singles were also helped by a certain number of old coupled engines, amongst which were 186 and 189, rebuilt double-framed Stephensons', originally dating from 1848–9, with 6 ft. wheels and 15 in. by 22 in. cylinders. Two others of the same class, Nos. 185 and 188, must have been considered as in their dotage, for they were never trusted with passenger trains except in cases of emergency, but spent the last few years of their lives in shunting work at Hull station.



NO. 465. FLETCHER STANDARD LOCAL PASSENGER ENGINE (675 CLASS).
Built at Gateshead 1873. Coupled wheels, 5 ft. 6 in. Cylinders, 15 in. by 22 in.

There were also two somewhat superior looking 2–4–0 engines with "mixed framing," the coupling rods being on the wheels. These were 254 (6 ft. 6 in.) and 260 (6 ft.), both of which had 16 in. by 22 in. cylinders, and had been constructed in 1857–8 at the York and North Midland Railway's York shops. These two not only ran regularly to Doncaster, but were frequently to be seen on the Hull and Scarborough trains, and having been rebuilt, survived as Nos. 1781 and 1728 until the early part of the present century.

Generally, however, the Hull and Scarborough trains, then the slowest of the slow variety, were worked by two types of 2–4–0

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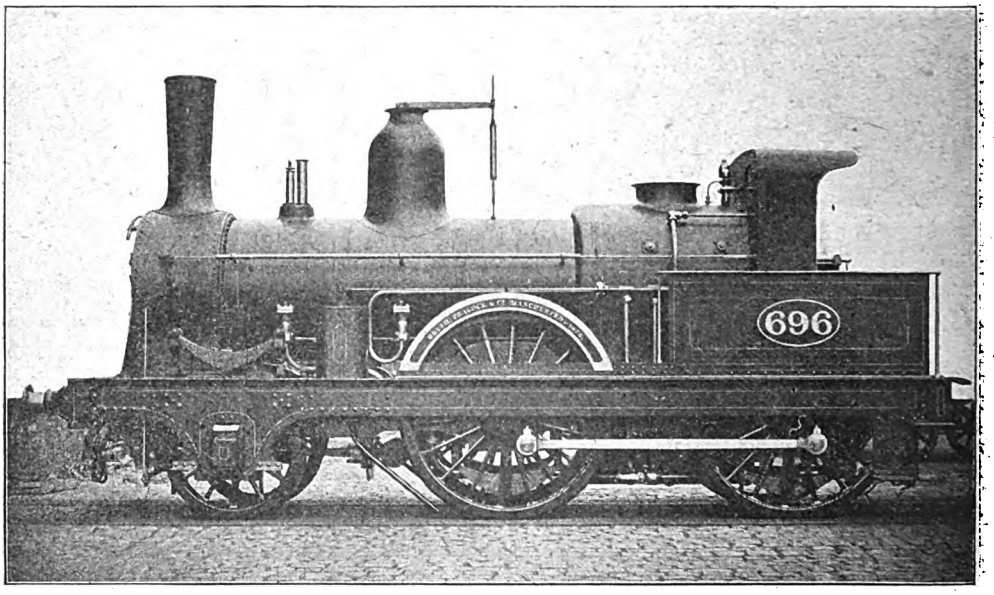
engines. The first was similar to the illustration of 271, and consisted of Nos. 271, 293, 213, 216, and 217. I believe No. 213 was quartered at Scarborough and used exclusively on the Hull line. The others were at Hull. The first two of these were York and North Midland engines of 1856–7, with 6 ft. wheels and 16 in. by 22 in. cylinders, and had been rebuilt at York about 1878–9. The illustration of 271 gives a very good idea of the style of the "York" engines during the period 1878–1883. The other three engines were very similar but were of E. B. Wilson origin and dated back to 1853. No. 214, a similar engine, also at tank engines. Of these engines, Hull had about a dozen for the services mentioned above, and three or four were stationed at Selby to work stopping trains to Hull, York and Leeds. York also had about nine or ten, which ran between that city and Harrogate, both *viâ* Knaresborough and *viâ* Church Fenton. The other seven or eight were on the Northumberland branches. A number of these engines were subsequently rebuilt about 1888 by Mr. Worsdell, who gave them 16 in. cylinders and made them into respectable looking locomotives; but they did not survive this change for many years, for, as far as my memory goes, they all disappeared



2-4-0 ENGINE, NO. 696 (SERIES 636-637), BUILT BY MESSRS. BEYER, PEACOCK & CO. (1870).
Coupled wheels, 6 ft. diameter. Cylinders, 16 in. by 22 in.
The safety valves behind the chimney were afterwards removed to the usual position over the firebox.

Hull, worked daily to York and back *viâ* Market Weighton.

But many of the Scarborough trains and also nearly all those to Hornsea and Withernsea were worked by a small class of 2–4–0 passenger engines—the 675 class—which may be considered to be one of Mr. Fletcher's standards. They are illustrated by No. 465, and had 5 ft. 6 in. wheels, 15 in. by 22 in. cylinders, and inside frames throughout. There were 35 of the class, all of which had been built at Gateshead between 1870 and 1875, and they performed a great deal of the work over the branches, both in the northern and southern divisions, that is now done by before the year 1900. They were quaint little machines in their original condition, and did much hard struggling with branch trains of about six or seven coaches. One of them, engine 181, stationed at York, spent a number of years of its existence on a beat backwards and forwards between that city and Harrogate, and I remember it principally on account of its driver. This engineman was one of the very old school, even for 1880, and was known by the sobriquet of "Sammy Sit-up." His real name was presumably chronicled on the pay sheets of the engine shed, but no sooner had he taken his engine outside the shed doors, than his name,

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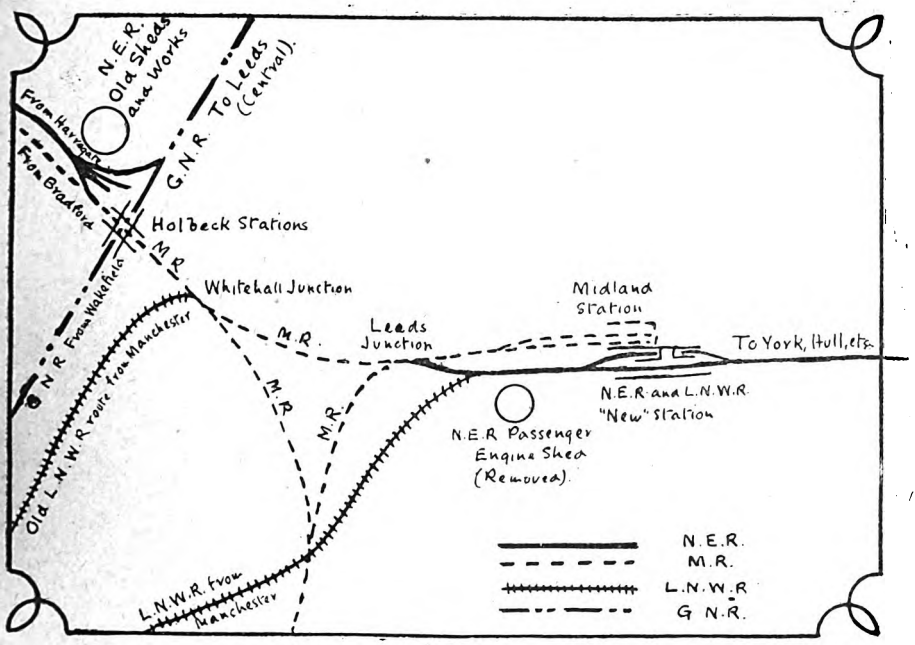
whatever it may have been, was promptly dropped and forgotten by everybody but himself. The origin of his nickname was due to a special method of his own in running the Harrogate trains. His train resolved itself into a leisurely procession, and by the time it had reached Starbeck, was generally "two down on bogey" for the course. Sometimes he extended this into three minutes dropped. On reaching Dragon Junction signal-box, about three-quarters of a mile from his final destination, a spot which was on a somewhat steep rising gradient into Harrogate station, he would suddenly wake up, and having solemnly explained to his mate that he was now going to make "the old girl (*i.e.*, 181) sit-up," he would open the regulator wide and pound 181 up the final few hundred yards with a blast that woke the echoes of the suburban villas in the district. By this effort he generally managed to recover some ten seconds or so of the lost time. I believe that the guards, who knew the old gentleman's idiosyncrasies, were somewhat lenient towards him in their "journals," and did not always book the full time against him.

Leeds is the next important centre demanding attention. The North Eastern at Leeds is in the peculiar position that its lines east of that town are separated from those to the north by a section of the Midland main line. To the east of the New station the North Eastern has its own line throughout to York and to Hull, but trains which depart from the other end for Harrogate and the north run over Midland metals from Leeds Junction to a point about 100 yards on the Bradford side of Holbeck station, where the North Eastern line to the north diverges to the right. Formerly there were only two roads over this crowded section, except through Holbeck station, where four roads existed. Moreover, until about 1882 London and North Western trains from the New station also used the same two roads from Leeds Junction as far as Whitehall Junction, so that with all the Midland trains included, and these being legion, there often arose confusion worse confounded at the busy periods of the day, and especially in foggy weather. The London and North Western Railway was the first to cut the Gordian Knot, for they boldly constructed their own line from a point about 150 yards from the New station to Wortley, an expensive undertaking, consisting entirely of viaduct over a portion of Leeds. This they opened, I think, in 1881 or 1882, and relieved the congestion by removing their trains from Midland metals.



PLAN OF RAILWAYS IN LEEDS DISTRICT.

It was many years before the North

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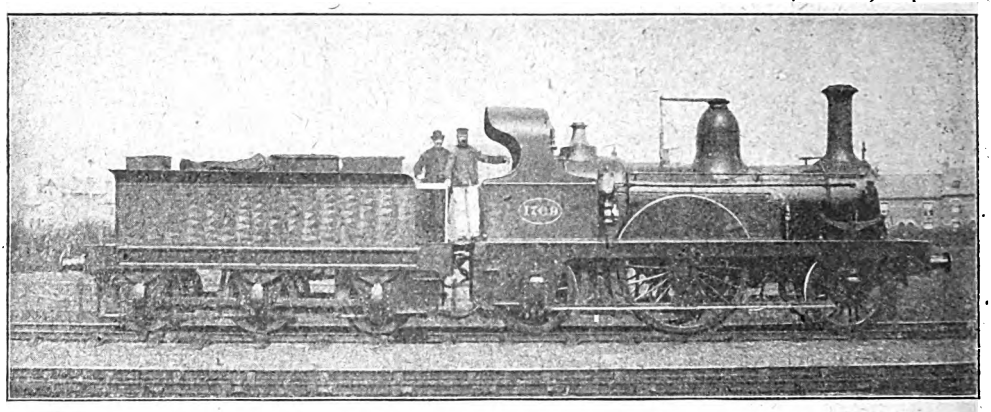

Photo] [*Locomotive Publishing Co., Ltd.*

6 FT. 6 IN. "SINGLE" ENGINE, NO. 1709 (FORMERLY NO. 159).
Built by Messrs. Stephenson & Co. in 1853 and altered by Mr. MacDonnell at York.
Cylinders, 16 in. by 22 in.

Eastern made a move, and this only a partial one. There existed a single branch line from Cross Gates, about 4½ miles east of Leeds on the Hull road, to Wetherby, on the Harrogate and Church Fenton line. By doubling this line, removing the old station at Wetherby, and constructing a loop at this point, they made an alternative line between Leeds and Harrogate, over which certain through express trains are now run, although the distance to Harrogate is thereby increased from 18¼ to 22½ miles. But it gives them the advantage of a line to the north which is entirely their own property. Nevertheless, a large number of trains still use the old route through Holbeck station, where most of them make a stop, for interchange of passengers with the Great Northern and Lancashire and Yorkshire Railways. These companies use Holbeck high level station, built immediately above the low level Midland station. The latter has, however, lost much of its former importance. Until about 1878 all Midland passengers from Bradford and the north had to change at Holbeck for Harrogate, Darlington, etc., so that almost all Midland trains stopped there. Now that there is a direct service between Bradford and Harrogate *viâ* Otley, the necessity for this has almost disappeared, and most of the Midland trains give Holbeck the cold shoulder. Consequently, there has arisen the phenomenon of a Midland station being used principally by North Eastern trains as an accommodation for through passengers to and from the Great Northern and Lancashire and Yorkshire lines. Midland ownership is, however, in evidence, for although the fare from Holbeck to Leeds by a Midland train is only a penny, the unwary traveller who sets foot in a North Eastern train for the same journey has to pay twopence, of which amount, I believe, the Midland pockets its full penny fare. This, however, is of no importance, for the advent of the electric trams has completely killed passenger traffic between Leeds and Holbeck.

The North Eastern authorities have improved matters by a complete change in the location of their engine sheds. The principal Leeds sheds and the repairing and rebuilding shops, which formerly belonged to the Leeds Northern (Leeds and Thirsk) Railway, were situated at Holbeck, and a large number of light engines going to and returning from Leeds used to help considerably in blocking the Midland main roads. Many, however, of the North Eastern passenger engines were stabled at a smaller shed just outside the west end of the New station. Some fifteen years ago the North Eastern built an entirely new and up-to-date locomotive depôt at Neville Hill, beyond Marsh Lane, on the east side of Leeds, and since then the older sheds at Holbeck and at Leeds station have disappeared.

Finally, the Midland itself made four roads from Leeds Junction through Holbeck, in doubling the whole line to Bradford, so that the old congestion has almost disappeared. But it took about 25 years for all these improvements and alterations to materialise.

North Eastern train services from Leeds to Harrogate, Thirsk and the North, left much to be desired in 1880. The best train

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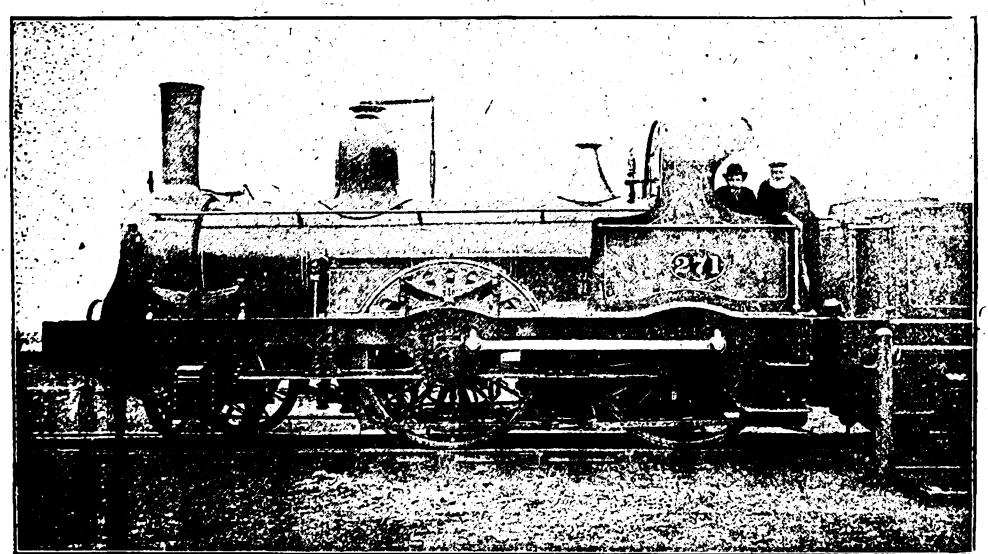
was the 5.30 p.m. from Leeds, largely used by business men living at Harrogate, and ran from Holbeck to Harrogate, 17¾ miles, in 30 min. The road is by no means an easy one for express trains. There is a long pull up to Horsforth, followed by a downhill run through the long Bramhope tunnel to Arthington Junction, where the line bends sharply to the right in crossing the river Wharfe. This is followed by another stiff rise to Pannal, which increases in severity to Crimple Junction. At this point there is one of the sharpest curves in the kingdom as the line bends round to the left at a right angle to obtain access to Crimple viaduct on the Harrogate and Wetherby line, before reaching Harrogate station, two miles away. The road thence to Thirsk is also of a severely undulating character.

The "main line" service is a relic of the old Leeds Northern Railway, for the Leeds trains run, with few exceptions, to West Hartlepool, and the route forms a sort of scissors crossing with the main line proper from York to Newcastle. Both sets of trains used the joint of the scissors, which consisted of the section of line from Thirsk to Northallerton, but more recently the North Eastern has doubled an old single cross-country line which ran direct from Melmerby (the next station north of Ripon) to Northallerton, and has thus materially shortened the route for certain expresses which avoid Thirsk. I have never been able to understand why this obvious improvement was not made years before, for the old line existed and had only to be doubled and strengthened.

Until 1883 all trains from Leeds made Saltburn or West Hartlepool their objective, though one or two had through coaches for Newcastle attached to and detached from main line trains at Thirsk. But in that year a new service of two trains in each direction between Liverpool and Newcastle was introduced, which I have already mentioned in dealing with the London and North Western Railway. On the North Eastern portion of the journey these trains for many years used the old Leeds Northern Railway from Northallerton to Stockton, and completed their journey to Newcastle *viâ* Sunderland, but some of the trains put on in later years now travel *viâ* Darlington and the main line. I have already mentioned these trains when dealing with the work of the Fletcher 7 ft. coupled engines. The more modern locomotive working is frequently of the "roundabout" order, in that a Newcastle engine will run to Leeds, then take a train thence to York, and return *viâ* the direct main line to Newcastle. This method involves no engine turning at any point, but it is only during the last few years that it has been so completely arranged.

Dealing now with the engines stationed at Leeds, which used to work from there over the Leeds Northern section in Mr. Fletcher's time, there was, of course, the usual variety of classes. A number, but by no means all of them, also had turns to York, Scarborough



Photo] [*Locomotive Publishing Co., Ltd.*

2–4–0 ENGINE, NO. 271, AS REBUILT AT YORK.
Coupled wheels, 6 ft. diameter. Cylinders, 16 in. by 22 in.

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and Hull, but one or two of the Leeds links were confined entirely to the north road.

In the first place, there were old 362 to 368, 6 ft. 2–4–0 engines with 16 in. by 22 in. cylinders; these had inside frames to the coupled wheels and outside frames to the leading wheels. Of these, 362 to 367 had been built by Kitson, Thompson and Hewitson—now Kitson & Co.—of Leeds, in 1849, and were fine engines for the period when they were designed. No. 368 was a very similar engine by E. B. Wilson, but with the old well-known Railway Foundry fluted dome. The Kitson engines, however, had round-topped domes with spring balance safety valves, almost of the pattern so long associated with Mr. Matthew Kirtley's Midland engines. The Kitson engines, except 364, finished their days about 1880 on the slow trains between Leeds and Harrogate, whilst 368 was relegated to the Castleford branch. The original boilers of all of them lasted throughout their whole career of more than thirty years; 364, however, was completely renewed at Leeds in 1875 as a larger engine with 17 in. by 24 in. cylinders.

Two famous engines always in evidence between Leeds and Thirsk were 215 and 218, somewhat clumsy looking 2–4–0 engines with double frames and 6 ft. 6 in. coupled wheels. These owed their origin to E. B. Wilson & Co., in 1853–4, and had the largest coupled wheels turned out by this once famous firm. The engines had been rebuilt at Leeds, after 218 had exploded at Holbeck, with severe cabs of the Stirling South Eastern pattern. Cylinders of these two were 17 in. by 22 in., but a smaller engine of similar type, No. 219, which also took turns to Thirsk, had only 5 ft. 9 in. coupled wheels and 16 in. by 20 in. cylinders.

There were also four double-framed coupled engines very similar to 219 in outward appearance, but with 5 ft. 6 in. wheels and 16 in. by 20 in. cylinders, and were stated to have come from Messrs. R. W. Hawthorn in 1848–9. These were Nos. 370 to 373, and had severely rigid outlines with Stirling cabs. The best known was engine 371, which being about the smallest passenger engine at Leeds, was consequently in 1876–7 put on to the most important train: the business express which left Harrogate for Leeds at 8.35 a.m., and made one stop at Horsforth. 371 had a monoply of this train for a long time, but 370 was relegated to the Leeds break-down train, on which work it gradually became so coal black that the Leeds authorities could stand it no longer, and proceeded to paint it a brilliant and aggressive green. The other two finished their days on the Pateley Bridge and Castleford branches respectively.

In addition to the above mentioned double-framed engines, there were also some similar to the Scarborough 25 and 29 classes, which though nominally of the same class, were, nevertheless, all of them radically different in detail; 147 (6 ft.) and 462 (6 ft. 6 in.) were somewhat similar to each other, and betrayed all the symptoms of the severe architecture in vogue in Leeds shops. But 683 and 459 (6 ft. 6 in.) retained their original Gateshead features, and in 1881 Gateshead rebuilt another of the class and transferred it to Leeds. This was No. 312, a 6 ft. 6 in. with a very ugly flush topped boiler. Whenever Gateshead had a few of the oldest "crocks" to spare, they were usually sent into the southern division as first-class express engines. It is true that they retained some themselves, or they could not have kept the train service going, but it was very rare for them to send a new passenger engine. No. 312 spent some years at Thirsk on a double daily trip to Leeds and back.

The above engines were supplemented by a few more modern looking engines with inside frames except for the leading wheels, which had outside bearings. There was a rebuilt 6 ft. 6 in. Hawthorn, No. 548, six 6 ft. Beyer, Peacock engines with 16 in. by 22 in. cylinders, of the 686 class, and three Stephenson engines of similar dimensions, Nos. 702 to 704. And finally, Mr. Fletcher constructed between 1876 and 1882, fourteen engines of the 1440 class, similar to the well-known 7 ft. engines, but with 6 ft. wheels only. These had 17 in. (some 17½ in.) by 24 in. cylinders, and of them, 1440, 1447–8–9, 486 and 488 (afterwards 159) were sent to Leeds. The 686 class had all Beyer, Peacock's well-known characteristics, such as completely open splashers, very long side panels, and coupling rods of extremely small cross-sectional area. The cabs, too, were quite special, and added one more feature to the variegated locomotive landscape of the North Eastern. Altogether Leeds possessed about 33 passenger tender engines of 13 different classes, but of some twenty different external appearances. Had it not been for a fairly homogeneous batch of six of the Beyer, Peacock's, and another of six of the newer 1440 class, the average would have been much worse than it actually was.

(To be continued.)

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The Western Lines of the London and South Western Railway. [No. I.]

By J. F. GAIRNS.

MELDON VIADUCT.

Historical Review.

ALTHOUGH it was not until 1860 that the London and South Western Railway reached Exeter from London, the Company had for fifteen years previously had railway associations in Devon and Cornwall, and these were largely responsible for the course of subsequent development. The leasing of the Bodmin and Wadebridge Railway (incorporated in 1832 and opened for traffic in 1834) right back in 1845, when there appeared no prospect of linking up with the main system, the nearest point reached by South Western metals at that time being some 200 miles distant, may be considered as an "incident" in the "railway politics" of the period, and as such not directly influencing subsequent action until a comparatively recent period, though its effect was by no means unimportant. But the position of the North Devon Railway is very different, for the fact that this and the Exeter and Crediton Railway came under London and South Western influence, although right in the midst of "broad gauge" territory, was largely responsible for the peculiar relations between the two railways concerned in regard to St. David's station, Exeter, besides constituting the nucleus of the now comprehensive system of railways directed from Waterloo, and which are reached from London *vid* the two chief stations in the capital city of Devonshire.

The "Taw Vale" Railway as the North Devon was originally titled, was first proposed in 1838 and revived in 1845, in association with the Exeter and Crediton Railway, to which it was intended to constitute an extension. As the Bristol and Exeter Railway reached Exeter in 1844 the proposals for these latter lines can be readily understood, there being then none of the main line problems which, in the light of subsequent events, might have complicated the situation. Both were, therefore, schemes for local extension of the facilities then provided, the one connecting the market town of Crediton with the capital of the county, and the other providing railway communication onwards to Barnstaple, the principal centre of North Devon, and thence to docks at Fremington Pill, a little way down the estuary of the Taw, thus reaching the Bideford and Appledore waterways, incidentally giving access by sea across to South Wales.

It is almost needless to say that both the Exeter and Crediton and the "Taw Vale" (later this became the "North Devon") Railways were constructed as broad gauge lines; but it is curious to note that the former was quite early placed under a leasing arrangement with the London and South Western Railway. Its story is a fascinating one, but cannot be repeated here, except to mention that the weathercock nature of its policy as it was swayed between the rival broad and narrow gauge "intrigues" of the period, has been epitomised by the title of the "Vicar of Bray" Railway. The North Devon (Taw Vale) Railway was professedly a broad gauge line—there are still many indications along it that it was once laid in this way—and as the London and South Western had not then reached Exeter, both lines were for a time worked by the Bristol and Exeter Railway, or by the contractor with broad gauge material. Indeed, even after the London and South Western Railway had taken over the working of these lines, the Bristol and Exeter, and later the Great Western Railway, continued to work traffic from Exeter to Crediton—equipped as mixed gauge—and they still have certain traffic interests in the line.

The North Devon Railway, as the Taw Vale was renamed in 1851, was opened to Barnstaple, with the extension to Fremington Pill, in 1854. It was further extended by a separate broad gauge undertaking to

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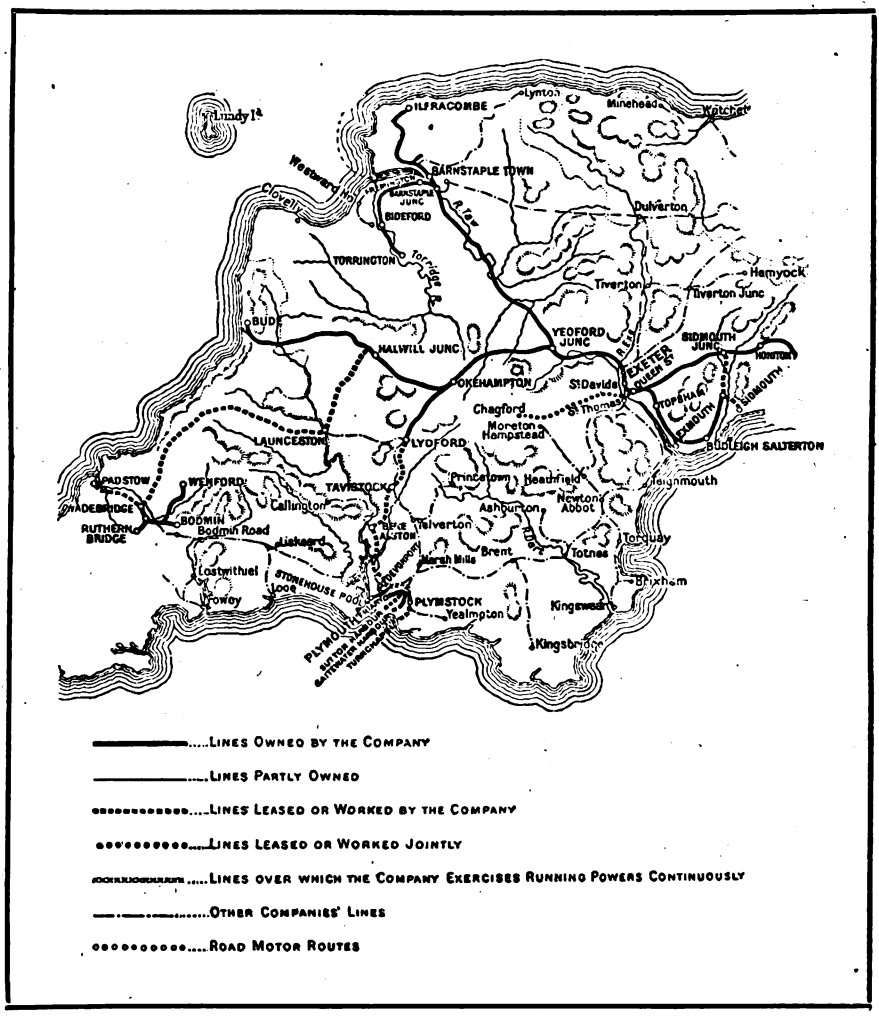
Bideford, this being worked in association with the North Devon line.

The fact that these sections were operated in connection with the Bristol and Exeter Railway helps to explain how it came about that, in view of the forthcoming completion of the London and South Western route from London to Exeter—1879 that the Exeter and Crediton Railway became finally amalgamated with the London and South Western, though in 1862 both the North Devon and the Bideford Extension lines were leased to them, amalgamation in their case occurring in 1865. Powers were obtained in 1860 for converting these lines to narrow gauge, this work being



MAP SHOWING WESTERN ROUTES, LONDON AND SOUTH WESTERN RAILWAY.

opened 1860—an agreement was made with the Bristol and Exeter Railway in 1859 giving the South Western running powers through St. David's station to Cowley Bridge Junction in order to reach the Exeter and Crediton line already leased by them. This agreement is at the root of the railway situation in Exeter, but it was not until completed in 1863. The Crediton line continued to have the mixed gauge for many years later.

Meanwhile the Bodmin and Wadebridge Railway continued its "splendid isolation." In 1845 it had been acquired by the Cornwall and Devon Central Railway, in opposition to the Cornwall Railway, but as they

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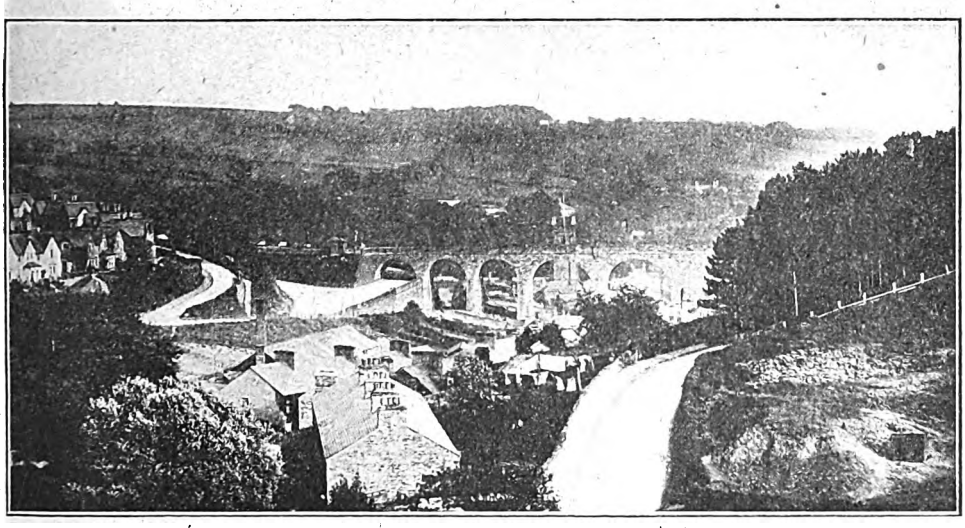
had no lines of their own, they apparently solved the difficulty by handing it over to the London and South Western Railway, the line being formally amalgamated in 1886. It was worked for a time by the original rolling stock, for a period under the oversight of the Great Western Railway, but in due course more definitely South Western material was introduced. But until the London and South Western Railway reached Wadebridge in 1894 it had to depend for outside rail communications upon the Great Western Railway, with which connection was made in 1888 from their Bodmin station *viâ* Boscarne Junction. It is interesting to observe, however, that although the Bodmin and Wadebridge section was the only one then constructed, the full scheme was of a much more ambitious nature, to extend from Padstow *viâ* Wadebridge and Bodmin to Lostwithiel and Fowey. Certain sections are covered by the old Cornwall Minerals Railway between Newquay, Lostwithiel and Fowey, now included in the Great Western system. In appraising the value of this little line it is necessary to remember that one of its branches, that to Wenford Bridge (6½ miles), taps the great Stannon Moor china clay area and the St. Breward district, going across to the waterside at Wadebridge—now at Padstow—for this important traffic. The same area is served southwards by the Great Western lines to Lostwithiel and Fowey, by means of the old Cornwall Minerals lines mentioned. This traffic will be further referred to in due course.

So much for the initial stages upon which the western system of the London and South Western Railway has been based, and the completion of the North Devon lines may be first considered.

The extension from Barnstaple Junction through Barnstaple Town (originally Barnstaple Quay station) to Ilfracombe was incorporated as the Ilfracombe Railway in 1870. It was promoted as a "light" line, with a lighter type of permanent way and construction, and therefore required special rolling stock until it was relaid some years ago. Traffic commenced in 1874, the line being worked by the London and South Western Railway. Great Western Railway through coaches are operated from Barnstaple Junction, and occasionally their engines are run through as a matter of arrangement when a complete independent train is required, as often occurs in the height of the summer season, but normally the vehicles are conveyed on South Western trains. In 1872 the Bideford line was extended to Torrington.



RAILWAY VIADUCT AT TAVISTOCK, LONDON AND SOUTH WESTERN RAILWAY.

Meanwhile further developments had been foreshadowed by the construction of a line from Yeoford Junction to North Tawton and Okehampton, opened 1868. The Plymouth line was the culmination of a series of schemes dating back to 1845, but that

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eventually carried out was made under powers conferred in 1862, as the Devon and Cornwall Railway. From Okehampton the first extension was to Lydford, opened in 1873. Thence to Plymouth the Great Western line *viâ* Tavistock and Yelverton was for a long time used, a third rail being laid for narrow gauge traffic from 1876. As this route was single track and there were many difficulties, the Plymouth, Devonport and South Western Junction Railway was promoted. This was opened to join the Great Western Railway near North Road, Plymouth, in 1890, the extension to Friary following in 1892.

From Okehampton branches off the North Cornwall Railway, which is leased and worked by the London and South Western Company. This was opened to Holsworthy in 1879, what is now the Padstow line from Halwill Junction being completed as far as Launceston in 1886. Six years later the latter section was extended to Tresmeer, to Delabole 1893, to Wadebridge 1895 (at last connecting up with the Bodmin and Wadebridge line), and in 1899 to Padstow. In 1898 the extension from Holsworthy to Bude was brought into use.

Western Train Services at Exeter.

Queen Street station, Exeter, forms the "division point"—to use a convenient Americanism—seeing that, even if coaches work through east and west of Exeter, trains require to be differently considered from the traffic point of view, and frequently the make-up is essentially altered for further running. Moreover, no engines work through on passenger trains from one section to the other, and the larger modern classes are not allowed on the western sections.

On the principal services, with through coaches for two or more of the routes concerned, it frequently happens that these become separate trains west of Exeter. Otherwise they will usually be either for Plymouth or for Barnstaple, Torrington and Ilfracombe, the fact that the latter trains use the main line for only a few miles causing them to be worked independently from Queen Street and not from Yeoford Junction. On certain services there are through sections for both the Plymouth and the North Cornwall lines, and these are worked to Okehampton separately or not according to the character of the traffic. But in several instances passengers require to change at Okehampton for the Bude and Padstow line, and there are certain cases where the trains concerned at Queen Street are only for Bude and Padstow or only for the North Devon line.

In practice this principle entails that trains run in groups, and where there is an isolated train it will usually be found that it acts as a pick-up for following trains.

The first westward train from Queen Street is at 6.55 a.m., all stations to Plymouth, with no connections to any other routes. But at 8.25 and 8.40 a.m. leave the two principal early services. The former misses the first train from Yeovil, though it is served by a motor train from Sidmouth Junction; but the latter is the continuation of the first Yeovil train. The 8.25 is a stopping train for Torrington, with Ilfracombe connection, while the 8.40 is a Plymouth train, with connection from Okehampton to Bude and Padstow. These two trains may be said to constitute No. 1 Group, but their traffic is mainly of an intermediate and local character.

Group No. II. is somewhat similar, the 8.13 a.m. from Salisbury going on as the 11.2 a.m. for Torrington and Ilfracombe, followed by the 11.42 a.m. for Plymouth, with Bude and Padstow connections, so that in this instance, also, two trains serve the three routes, both calling at every station.

No. III. Group is again of two trains, but under present conditions serves only two routes, partly as semi-express. This is the continuation of the 8.50 a.m. from Waterloo, the first portion of which goes on at 1.14 p.m. as a semi-express for Plymouth, followed by the 1.22 p.m. for Torrington and Ilfracombe. That this is not express on the latter route is due to the fact that the following 11.0 a.m. service from Waterloo is *the* express of the day for all routes, the Plymouth line being the only one which calls for superior facilities, and then mainly on behalf of stations not served by the first portion of the 11.0 a.m. train, or for traffic other than from London and Salisbury.

Group No. IV. is a triple one, quadruple in character, and frequently so in fact in the height of a normal summer season. The 11.0 a.m. express from London, which calls at Salisbury and Sidmouth Junction only to Exeter—in a "peace" summer this may be two or three heavy trains from London, one or two non-stop Waterloo-Salisbury-Exeter, and has often been duplicated even during the last summer—is due in Queen Street at 2.18; and the Plymouth portion goes on at once at 2.23 p.m., calling only at

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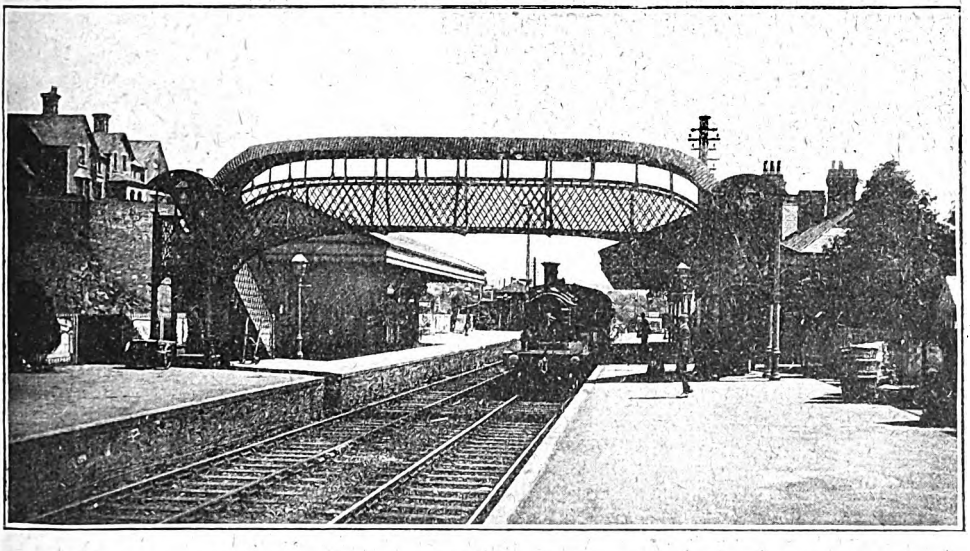
Tavistock between St. David's and Devonport. Immediately behind it is the 2.29 p.m. for Ilfracombe and Torrington, non-stop from St. David's to Barnstaple Junction. Then comes the 2.36 p.m., all stations to Plymouth except Sampford Courtenay, and this takes also the Bude and Padstow portions. Before the war the latter portion was often run as a semi-express, and supplied with a dining car.

No. V. Group is based on the 12.48 p.m. from Salisbury, one train leaving at 4.29 p.m. for the Torrington and Ilfracombe route, with a 4.42 p.m. stopping train to Okehampton, forming a pick-up for the following express service. No. VI. is again a two-train group, formed by the sections of the



EXPRESS TRAIN ENTERING TAVISTOCK STATION, LONDON AND SOUTH WESTERN RAILWAY.

1.0 p.m. from Waterloo, the 5.17 p.m. from Queen Street being semi-fast to Plymouth and also taking the Bude and Padstow portions, while the 5.26 p.m. serves the North Devon routes. The final group (No. VII.), is again of three trains, based on what is now the 3.25 p.m. from Waterloo. First is the 7.0 p.m. semi-express for Plymouth, followed by the 7.7 p.m. for Barnstaple Junction (in normal times this is run through to Torrington and Ilfracombe), with the 7.20 p.m. all stations to Plymouth, with connection from Okehampton as far as Launceston. The only other trains from Queen Street westwards are the 9.30 p.m. to Crediton, and the 10.25 p.m. which is continued through to St. David's to complete the work of the 5.50 p.m. from Waterloo, except on Wednesdays when it goes as far as Crediton.

Not a very remarkable train service it may appear on first inspection, but it must be remembered that these are the war period arrangements corresponding to those of a normal winter, such amplifications as have been made during the last summer consisting mainly of the duplication of facilities as required by the volume of traffic. And even in normal times there is a peculiar characteristic of the traffic which governs the whole situation, and that is the primarily holiday character of the larger proportion of passenger traffic from London in regard to the North Devon and North Cornwall routes, the concentration of so much of it upon the 11.0 a.m. express from Waterloo, and the importance of so many of the intermediate stations, for long-distance tourist travel as well as locally, in view of the peculiar attractions the inland districts of Devon and Cornwall have to offer. It is virtually certain that express running of more of these trains would involve putting on a new slow train for each, so that the policy adopted is to base the normal arrangements upon the standard requirements of the districts concerned, improving the facilities in the height of the summer season as the loads demand.

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Thus it is essentially the 11.0 a.m. from Waterloo which carries the bulk of the holiday traffic, all other services being concerned as much with local as with through traffic, except in the case of the Plymouth line, which has a greater element of business travel and which therefore has a larger number of trains and more express or semi-express facilities. As showing what the summer traffic of these lines involves, it may be mentioned that even during last summer, the up services corresponding to the 11.0 a.m. train down from London were amplified for several weeks on certain days by a 10.55 a.m. from Padstow and 11.52 a.m. from Bude, calling at principal stations only to Halwill Junction and then through to St. David's, Exeter, being continued as an independent train right through to London, while an additional service was given from Torrington at 9.50 a.m. to connect with the 9.35 a.m. express from Ilfracombe. Moreover, all these were really heavy trains and although groups of trains arrive at Queen Street from the west to go forward as one train, it has been, as in normal times, not infrequently necessary to work them through independently.

From Exeter to Okehampton.

Calling for first attention is the ever-interesting descent of the famous incline from Queen Street to St. David's. In the past the Plymouth express portion of the 11.0 a.m. *ex*-Waterloo—then leaving at 10.50 a.m.—has been booked to pass St. David's, but in view of the importance of the exchange traffic with the Great Western Railway, which applies in both ways between the two companies, even this train had been again retimed to stop there, even before the war. Therefore every down train has to descend the incline of 1 in 37, through the tunnel, to St. David's, and several minutes are usually required to deal with the passenger and luggage traffic incidental to exchange with the Great Western Railway. South Western trains almost invariably use the central island platform at St. David's, but their directions are opposite to those of Great Western trains in regard to London or Plymouth traffic. Consequently, at St. David's, together with North Road and Mutley stations in Plymouth, it is necessary to classify routes as "down Great Western and up London and South Western" or *vice versa*, and until the situation is fully understood it is decidedly confusing.

For mounting the Exeter incline, which is 1 in 37 for nearly half-a-mile, up South Western goods and the heavier passenger trains take a banking engine, for which a spur siding is provided at the end of the central island platform at St. David's. Four or five bogie coaches are, however, taken single-handed up the bank both by 6 ft. 6 in. and by 5 ft. 6 in. 4–4–0 South Western engines. When trains are heavy the banking engines—0–6–0 tanks—have a good deal of work to do, but at normal times one assisting engine can deal with all requirements. Occasionally, in the summer, certain trains have to be double-headed, as the grades west of Exeter are severe on all routes, and if a bank engine is sent down attached in front one may see the unusual spectacle of three engines heading a train. The writer has, indeed, seen two bankers sent down in this way, making four engines in front, as also a double-headed train with two tanks behind going up the bank, but double bankers are now never employed, and double heading is unusual except for working an engine home, and on one or two particular trains which load very heavily at times.

Once away from St. David's down South Western trains have a clear run to Crediton, leaving the Great Western Railway at Cowley Bridge Junction, and immediately the scenic beauties of these lines are manifested, as the River Exe is crossed, and in the vicinity, though only in a mild degree compared with further sections.

Crediton is a pretty little country town, and is omitted only by the special through expresses. Yeoford Junction is mainly of importance for traffic exchange. On the down side it has an island platform but on the up side has only the usual platform, as there is not much junction business done, the North Devon trains being usually worked separately from Exeter as already mentioned. A short distance beyond—at Coleford Junction—the North Devon line branches off towards the hills in picturesque surroundings. Along the main line, too, natural beauty is becoming the necessary association of the railway, and near the pretty flowered station at Bow a fine view of the hills is had.

As Okehampton is approached the majestic "tors" of Dartmoor come into view, the line skirting the higher ground, largely on ledges cut from the slopes, so that on one side one has magnificent views over the moorland and between the hills, while on the other are the heights of Rough Tor, with

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Cawsand Beacon (1,789 ft.) to the east, and immediately ahead Yes Tor (2,028 ft.) and High Willhays Tor (2,039 ft.), besides many other lesser eminences. Okehampton station itself is built on a ledge, the moorland heights rising far above the line on the down side, while on the up side one has a magnificent view over the picturesquely situated town and along the Okement Valley.

A busy agricultural centre, Okehampton is a splendid centre for excursions, also for hunting and fishing, while it has high repute as a health resort. Adjacent to the station at Okehampton is an engine shed for three or four engines and sidings, as certain of the North Cornwall line trains terminate there. A little beyond is a well-equipped ballast-crushing plant at a quarry belonging to the railway company. For this traffic a number of all-steel bogie hopper wagons are employed. The North Cornwall line does not diverge until Meldon Junction is reached, some two miles from Okehampton, so that all trains have to cross the famous Meldon viaduct, an apparently slender steel structure spanning the valley, 154 ft. below in the centre. In crossing the viaduct truly magnificent views are displayed.

Okehampton to Plymouth.

Although the approach to Okehampton from Exeter is most impressive, it is beyond that the full glories of the Dartmoor heights, as far as they can be seen from the railway, are revealed. After passing Meldon Junction the railway skirts the bases of many of the Dartmoor tors, continuing several hundred feet above sea level, and through Bridestowe and Lydford to Tavistock is, perhaps, the most grandly picturesque portion of this beautiful route.

The country hereabouts is, in fact, rugged and wild, broken by ravines and gulleys and with the tors and heights on the down side close to the line. A continuous series of splendid views is opened up as the line winds its way southwards. A feature of the station at Bridestowe is the display of shrubs trimmed to all sorts of fancy shapes, with grotto borders, which decorate both platforms, the down side particularly.

Approaching Lydford glimpses are had along the valley of the Lyd, as the viaduct is crossed, with stretches of gorse or heather-clad moorland on both sides. Lydford Junction provides for exchange with the Great Western Railway, whose single-line route to Launceston curves away from the station towards the west. The two stations are side by side, connected only by exchange sidings, but before the completion of the Plymouth, Devonport and South Western Junction Railway, formed the termination of South Western ownership, the journey to Plymouth being completed before 1890 over the Great Western route *viâ* Tavistock and Yelverton. In fact, we have now reached the limits of South Western ownership, even under present conditions, seeing that the Plymouth, Devonport and South Western Junction Railway is the property of an independent company, leased and worked by the London and South Western Railway.

From Lydford Junction the two lines continue side by side for several miles, South Western trains having double track, while the Great Western line is single. A peculiarity is that the intermediate stations do not agree, stopping trains on the former calling at Brentor (at the foot of Black Down, 1,035 ft. above sea level), and the latter at Mary Tavy, over a mile away. A little distance further on the Great Western line gradually descends and passes under the Plymouth, Devonport and South Western Junction Railway line (for convenience, this will be reckoned as London and South Western, as it is for traffic purposes) and thence falls away down into the valley to the town of Tavistock. All the way from Okehampton the railway has kept close company with the heights of Dartmoor, though on the fringe of the high lands, but the ruggedness which was characteristic of the Okehampton–Lydford section, has gradually given way to verdure-clad slopes and scenic beauty of a different class. At Tavistock, where the South Western station is perched high on the hillside, one overlooks the picturesque old town, with the Dartmoor heights as background. Tavistock is a favourite centre for exploring Dartmoor and other beautiful districts adjacent. It is famous, among other things, for its Abbey, founded in A.D. 961, of which some portions are still in use. From the South Western station one may, perchance, discern the steam from a Great Western train starting from the station down in the valley, while dense foliage indicates the presence of the River Tavy, whose winding course keeps company with the South Western line until near Bere Alston. On this section are some deep rock cuttings, and one or two short tunnels.

Approaching Bere Alston station the sinuous course of the beautiful Tamar comes into sight on the up side of the line, and

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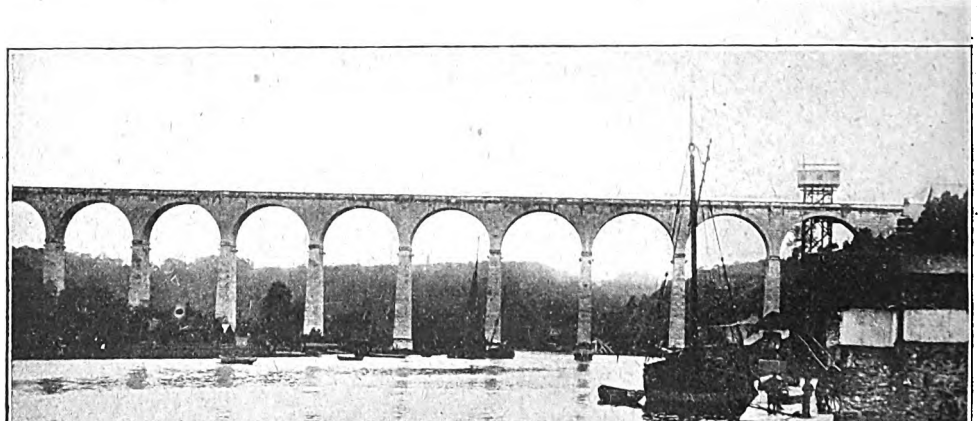
about a mile before reaching the station a fine view is had of the famous Calstock viaduct on the Bere Alston and Callington line. This railway, which incorporates a part of the old East Cornwall Railway, is now part of the Plymouth, Devonport and South Western Junction system, but whereas the main line is leased and worked by the London and South Western Company, the branch is operated as a separate concern, with its own rolling stock—it is technically a "light" railway—and its own staff, Mr. H. G. Hartnell being Secretary and Manager. This line is dealt with in a separate article, so that it will be sufficient to mention that it penetrates for nearly 10 miles into what was once one of the most prosperous of the Cornish tin and copper mining districts; terminating near the busy market town of Callington, at the foot of Kit Hill. The terminus is known as Callington, but is more correctly at Killy Bray, Callington being about a mile away.

The station at Bere Alston is under the direction of Mr. Perry. Here a relatively considerable amount of traffic is dealt with, largely exchange with the Callington line, a feature being the strawberry traffic in the season. This is centred mainly upon Bere Alston and Calstock stations, the latter exchanging at the former, so that for a few weeks in the year it is by no means unusual for from six to eight vans at least to be despatched daily, and frequently more, calling for special provision. There is also a good deal of general agricultural traffic, while the strawberry traffic is amplified by raspberries, plums, gooseberries and apples in large quantities, with a very appreciable traffic in flowers. All the branch line traffic, of course, passes through Bere Alston, and although there is not much done now with minerals, there is an important brickworks at Chilsworthy, whose output is no small factor. Bere Alston is, further, a favourite place for picnics and excursions from Plymouth, so that in the summer months the station is often a busy one, and in normal years is largely used in connection with day and half-day trips out from Plymouth.

(*To be continued.*)



VIADUCT AND WAGON LIFT, CALSTOCK: BERE ALSTON AND CALLINGTON LINE.

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The Bere Alston and Callington Line.

Plymouth, Devonport and South Western Junction Railway.

7-CHAIN CURVE AT HAREWOOD, NEAR CALSTOCK.

FORMING part of the Plymouth, Devonport and South Western Junction Railway, the main portion of which is worked by the London and South Western Railway, the Bere Alston and Callington line is operated independently with its own locomotives and rolling stock, Mr. S. G. Hartnell being responsible for the management and working. This line is in some respects a reconstruction of the East Cornwall Mineral Railway, opened in 1872 for the traffic of the mines and quarries in the neighbourhood of Gunnislake and Callington, connecting there with the banks of the Tamar at Calstock. There was, of course, at that date no railway at Bere Alston to connect with. It was a light line, built to the 3 ft. 6 in. gauge, and the wagons were lowered to or raised from the quay at Calstock, a distance of about 100 ft., by a rope line. The conditions and methods of that period are fully described in an article published in the February, 1908, number of the RAILWAY MAGAZINE.

In 1891 the Plymouth, Devonport and South Western Junction Railway purchased the line, and to connect it with the Plymouth line which had recently been opened it was decided to construct the costly Calstock Viaduct and to extend the line to Bere Alston station. The scheme also entailed entire reconstruction of the old line between Calstock and Gunnislake, about three miles, besides altering the whole to standard gauge and equipping it in modern fashion, though still on "light" principles. Total length is now 9½ miles, and was brought into use as remodelled on March 2nd, 1908. Besides the three locomotives referred to later, there are 8 passenger vehicles and 53 goods wagons, some of which are, at times, worked through on to the London and South Western Railway.

Leaving Bere Alston station, where there is a separate platform at the back of the up main line platform, with goods and exchange sidings, the line curves away, giving splendid views of the picturesque valley of the Tamar, and of the now famous viaduct at Calstock, with a few railway wagons on the quay, 80 ft. below, brought there by the wagon lift installed. The viaduct is of concrete, with 12 arches, each of 60 ft. span, and the height of rail level above the river being 120 ft. The wagon hoist provides for a vertical lift of 113 ft., and takes standard four-wheeled wagons fully loaded. A steam winding engine is installed for operating the lift.

The station at Calstock is immediately beyond the viaduct, and as the town is a somewhat important centre, there are several sidings for local goods traffic, and in connection with the wagon hoist. Although the line is already high up, it continues to climb along the hillside, the magnificent scenery being diversified by factory chimneys here and there, affording evidence of the once extensive tin and copper mining activities

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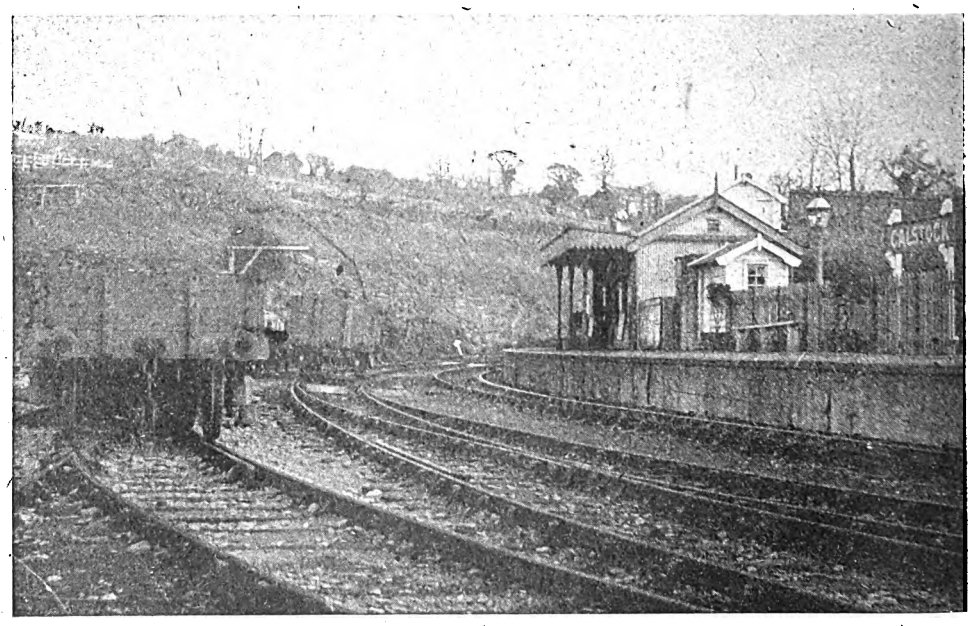
of the district, though few of these chimneys now diffuse smoke, and many of the factories adjacent are in ruins.

Gunnislake is a fairly busy town on top of a hill, and there are sidings here. Just beyond can be seen the head of the old rope railway leading down to the banks of the Tamar far below, though this is now disused. Here the views across the valley splendidly display the winding and exceptionally beautiful Tamar, owing to the great height at which the railway runs, while in the distance are the "tors" of Dartmoor. At Chilsworthy the line is again right on the hillside, with ruined factories and rubbish heaps in the vicinity, telling of a former industrial prosperity. Near here is a modern brickworks, whose products now form an appreciable section of the traffic of the line.

From Luckett is a descent to Callington —or, more correctly, Kelly Bray, as the town of Callington is about a mile away—overshadowed by Kit Hill (1,067 ft.), its crown surmounted by a tall chimney associated with the once busy Kit Hill tin mines. At the terminus is a covered station, with goods yards, engine sheds, etc., adjacent.

Traffic is controlled by the staff and ticket system between Bere Alston and Calstock, but electric train tablet apparatus is used over the remainder of the line, the tablet stations being Calstock, Gunnislake, Luckett and Callington.

Gradients are very severe, in places 1 in 37, but except on market days and special occasions three or four coaches suffice for passengers, though generally one or more goods vehicles are also conveyed. For periods of pressure one or more South Western vehicles are occasionally borrowed. Altogether trains may load up to 9 or 10 vehicles, including probably four vans for market produce, which is now a big factor, and when this is the case only the larger engines can work the trains. Occasionally goods traffic is worked independently, but not if that can be avoided.



CALSTOCK STATION.

Three engines are in use, all built by Messrs. Hawthorn, Leslie & Co., of Newcastle-on-Tyne. The two newer ones are 0–6–2 outside tank engines, No. 1 *Earl of Mount Edgcumbe*, No. 2 *Lord St. Leven*, with No. 3 *A. S. Harris*, 0–6–0 class. These names are those of present and late directors of the company.

In the season, strawberry traffic is an important factor, and from 10,000–12,000 baskets are sometimes sent away in the course of a year, representing from 300–350 van loads, and about 14 per day. Calstock is the principal centre for this, and other fruit traffic, which goes to swell the total

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dealt with at Bere Alston station, as referred to elsewhere.

Mining traffic is tending to disappear almost entirely, but for general goods Callington is a centre for a very wide area, and for some purposes is favoured even in preference to Launceston. There is, however, the brick and firebrick industry, which is developing at Chilsworthy, while a new home farm established by the Duchy of Cornwall near Callington is the cause of a fair amount of traffic. There are also some quarries and mines still in operation at Kit Hill. The Calstock wagon lift was originally installed to provide access to the banks of the Tamar in place of the old inclines and rope railways, but with the decline of mining is now little used. With new methods and systems, there are, however, prospects that some of the old mining activities will be revived.

But it is upon general and agricultural traffic that the railway now principally relies on the goods side, and upon tourist travel and local requirements on the passenger side. During 1915 some 15,000 passengers were conveyed. As a tourist centre Callington is gradually being better known, as it is in the midst of country of surpassing beauty and interest. As for the journey itself from Bere Alston to Callington, we can only describe it as a constant succession of scenic views almost unrivalled, as the line winds its course along the hillside, overlooking the valley of the Tamar across to the heights beyond.

MR. S. G. HARTNELL.
Manager: Bere Alston and Callington Section, Plymouth, Devonport and South Western Junction Railway.

Mr. S. G. Hartnell, Manager, began his railway career in 1894 in the office of the London & South Western Railway District Superintendent at Exeter, and subsequently served in the Parcels Offices at Bude, Chard and Tavistock stations. Upon the opening of the Plymouth, Devonport and South Western Junction Railway, he was appointed clerk at Calstock, and in January, 1909, was promoted Clerk-in-charge to Mr. H. F. Stephens, of Tonbridge, the then Manager, whom he succeeded in 1911.

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British Railway Service and the War. [IX.]

RECENTLY the Secretary of the War Office announced that the Commander-in-Chief of the British Army in France had appointed Sir Eric Geddes (late Deputy-General-Manager, North Eastern Railway), to be Inspector-General of Transportation, which post he holds in addition to the position, already announced, as Director-General of Military Railways. A subsequent issue of the *London Gazette* notified the appointment of Lieut.-Col. Sir E. C. Geddes, R.E. (T.F.), to be Temporary Honorary Major-General, and to be Inspector-General of Transportation and Director-General of Military Railways. The Secretary of State for War has also appointed Sir W. Guy Granet, General Manager, Midland Railway—whose services have been placed at his disposal by the Board of Directors of that railway—to be Deputy-Director-General of Military Railways in the War Office.

Mr. Alan Garrett Anderson, a member of the Midland Railway Board of Directors, and Mr. J. Field Beale, of Messrs. Beale & Co., solicitors to the Midland Railway, have been appointed members of the Royal Commission appointed to control the supply of wheat and flour.

Lieut.-Col. John Waller Hills, M.P. for Durham City, a Director of the Midland Railway, has been wounded in action.

The following appeared in the *London Gazette* recently: "Territorial Force Re-

CHIEF INSPECTOR LAKE AND THE FEMALE TICKET-COLLECTORS AT PADDINGTON, GREAT WESTERN RAILWAY.

serve, Infantry.—Capt. (temporary Major) P. M. Payne, from Notts. and Derbyshire Regiment, to be Captain, October 23rd, 1916." In civil life this officer is Rating Surveyor, Midland Railway, Derby.

A list of recent awards for gallantry contained the name of Major Victor Michael Barrington-Ward, R.E., who, "during a fire at an ammunition depôt, took an engine between sheds where ammunition was exploding and brought back 15 men who were exposed to considerable danger." Before joining the colours, Major Ward, who receives the D.S.O., was attached to the Midland Railway at Derby, first in the

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Engineer's Department and then in the General Superintendent's Department.

Lance-Corpl. Henry Fallon, Midland Railway, Derby, has been awarded the Military Medal and Bar, a somewhat rare distinction. He had previously been awarded two gallantry "cards."

The Military Medal has been awarded to Lance-Corpl. Alfred P. Bone, of Wells, for distinguished field service in France. Lance-Corpl. Bone entered Great Eastern Railway service at Wells in 1905 and subsequently also served in various clerical capacities at Brandon, Cromer, North Walsham and Harling Road. He enlisted in the R.E., July 20th, 1915, and proceeded to France last December.

Lance-Corpl. W. C. Davis, R.A.M.C., of the Audit Office, Paddington, Great Western Railway, has been awarded the Military Medal and promoted to Corporal, for gallant conduct in the field during an attack near Ginchy.

The Military Medal has been awarded to Pte. H. M. Pugh, Gloucestershire Regiment (labourer in the Great Western Railway Sheet Department at Gloucester Docks), for going out under heavy fire and being successful in securing important despatches.

Company Sergt.-Major Alfred Fowles, Gloucestershire Regiment (carman in the Goods Department at Wolverhampton, Great Western Railway), has been awarded the Military Cross for conspicuous gallantry in action. When his officers were struck down he took command of the first line, rallying and urging men forward, under heavy fire. On another occasion also he had shown great bravery.

Capt. H. H. Grindley, R.F.A. (London and North Western Railway), who has been acting as one of the R.T.O.'s in Macedonia since November last, has recently been put in charge of the Traffic Department of the Jonction-Salonique-Constantinople Railway, with the designation of "Traffic Superintendent."

Official intimation of the death of Second-Lieut. Stanley George Marriott, Royal Engineers, youngest son of Mr. William Marriott, Locomotive and Way and Works Engineer, Midland and Great Northern Railways Joint Committee, has been received with deep regret. He was educated at Greshams School, Holt, and took the Oxford and Cambridge Higher Certificate. Matriculating at Glasgow University, he, after a pupilage with his father at Melton Constable, passed the Associate-Members' examination of the Institution of Civil Engineers, and was recommended for a commission in the Royal Engineers. He was in the front line till he was killed in action on October 21st. Prior to joining the Army, Lieut. Marriott was in the District Engineer's Office, Midland Railway.

During the last four months more than 130,000 soldiers and sailors have been fed at the Free Buffet at the Great Eastern Railway's Liverpool Street station, London. The average attendance is about 1,000 a day.

We are indebted to the *Great Western Railway Magazine* for the photograph reproduced showing Chief Ticket Inspector Lake and the female ticket-collectors at Paddington. In this connection it is pleasing to note that recently a presentation took place at Paddington station, when Mr. H. Holbrook, Assistant Stationmaster, on behalf of the subscribers, presented Miss Pike, Chief Ticket Collector, with a brass kettle mounted on a stand with spirit lamp. Chief Ticket Inspector Lake was in the chair. Subscriptions had been confined to the ticket collecting staff, male and female, and the presentation, made in view of the approaching marriage of Miss Pike, was unique, the recipient being the first to be married from the female staff, and the presentation the first to any of the female staff at Paddington station.

On the Metropolitan Railway, out of a total of 3,600 employés, 669—or over 18 per cent.—have joined His Majesty's Forces, while a further number of 1,107 have attested under Lord Derby's scheme. 27 members of the staff have fallen in the discharge of their duty to their King and Country.

Vehicles belonging to a new ambulance train, built by the London and North Western Railway for the War Authorities, were again on exhibition at No. 12 platform, Euston station, on December 4th, between the hours of 8 a.m. and 8 p.m. A charge of sixpence was made for each person inspecting the vehicles, receipts going to Benevolent Funds connected with the London and North Western Railway. Vehicles on exhibition included six ward cars, for lying-down and sitting-up cases; one pharmacy car containing all necessary accommodation for medical appliances, and a treatment-room equipped with operating table, etc.; one staff car, with accommodation for medical officers and nurses; one personnel car, with kitchen and cooking

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A GREAT NORTHERN RAILWAY ROLL OF HONOUR.

GREAT NORTHERN RAILWAY COMPANY.

DECORATIONS AWARDED TO MEMBERS OF THE STAFF WITH HIS MAJESTY'S FORCES IN THE GREAT WAR

NAME	REGIMENT	RANK	GRADE	STATION	NATURE OF DECORATION
GRATTON, E. H.	Leicestershire	Private	Porter	Derby	Distinguished Conduct Medal
	For conspicuous gallantry on the 28th October, 1914, near Rue de Bois, when he brought up ammunition under a heavy fire from the enemy, who were at a distance of only thirty yards. He behaved with such gallantry on another occasion the same day.				
CARTER, C.	A.S.C.	Driver	Platelayer	Potters Bar	Medaille Militaire pour valeur et discipline
	When under enemy fire, the Major called for volunteers to fetch a load of ammunition which was urgently needed. Carter volunteered, although he had previously been in the saddle for about 20 hours. October, 1914.				
LEADBEATER, C.	Lincolnshire	Sergeant	Signal Gangman	Louth	Distinguished Conduct Medal and Clasp
	MEDAL: For conspicuous gallantry near Zillebeke on 30th September, 1915. When a mine was exploded under trench 17, the non-commissioned officer was in charge of the listening post at the end of the trench, and was blown over the parapet by the explosion. He at once crawled back, and although seriously injured, collected his men, opened rapid fire on the enemy, and remained in command until ordered to go to a dressing station. **CLASP**: For conspicuous gallantry and resource on 13th October, 1916, at Hohenzollern redoubt, when he took charge of part of "North Face." When the bombers were unable to advance further, Leadbeater built a barricade and consolidated the trench. Later he spent the night in bombing, and the following day he acted as a stretcher-bearer, regardless of all personal danger. He had previously been brought to notice for conspicuous bravery.				
PACEY, W.	K.O.Y.L.I.	Lnc.-Corporal	Wagon Painter	Doncaster	Distinguished Conduct Medal
	"London Gazette," 11th January, 1916.				
WEATHERALL, A.	Lancashire Fusiliers	Sergeant	Platelayer	Leeds	Distinguished Conduct Medal
	For conspicuous bravery and devotion in charge of bomb-throwers, and in a sap occupied by the enemy as well as ourselves. A continuous bombing fight was carried on during four days, and the casualties were very heavy. All the bomb-throwers, when he originally took in were either killed or wounded. ("London Gazette," 11th March, 1916.)				
BAGGLEY, J.	Lincolnshire	Sergeant	Clerk	Skegness	Military Medal
	For general bravery on 14th April, 1916, in attempting the rescue of two of his men at a listening post near the German trenches after the explosion of a mine. He got over the parapet to get at the men but was overcome by ground gas and collapsed.				
WILSON, W.	Northamptonshire	Sergeant	Foreman Cleaner	Peterborough NW Shelford	Distinguished Conduct Medal
	For conspicuous gallantry and initiative. During an extreme bombardment by the enemy he showed great coolness when securing the defences against any attack. Later he led a bombing party down the trenches on his flank and discovered that the enemy had carried out a raid. He at once placed sentries and assumed command of these trenches until relieved. ("London Gazette," 20th June, 1916.)				
PARTRIDGE, J. N.	R.A.M.C.	Private	Clerk	Leeds Goods	Military Medal
	For devoted conduct on 3rd September, 1916, in Thiepval Wood, in carrying stretcher cases to the Collecting Post under heavy shell fire.				
TAYLOR, C.	London Rifle Brigade	Lnc.-Corporal	Clerk	King's Cross Mineral Dept.	Distinguished Conduct Medal
	For conspicuous gallantry in action. He led his bombing section with great courage and determination, himself killing five of the enemy. He had previously carried out a daring reconnaissance. He was severely wounded. ("London Gazette," 14th November, 1916.)				
BETTS, L. B.	Machine Gun Corps	Lnc.-Corporal	Clerk	Woolwich	Distinguished Conduct Medal
	For conspicuous gallantry in action. Although wounded, he continued to carry a tripod until ordered to hand it over. He then acted as runner, making three journeys through heavy shell fire. ("London Gazette," 14th November, 1916.)				
COURAGE, P. M.	Yorkshire	Lieutenant	Pupil Engineer's Dept.	King's Cross	Military Cross and Bar
	MEDAL: Accompanied by one man, he rushed six of the enemy and took them prisoners. He has on many previous occasions done very fine work. **BAR**: For conspicuous gallantry in action. He led a clearing party with great courage and skill, single-handed, capturing 12 prisoners in a cellar. He has on many previous occasions done very fine work. ("London Gazette," 25th November, 1916.)				

The border of this artistic poster, the original of which is splendidly reproduced in colour, includes representations of the principal British, French, Russian and Italian military decorations.

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conveniences and accommodation for orderlies; and a guard's van, with accommodation for stores, etc. There was a large attendance, over 2,000 people passing through it during the day.

Several recently earned honours awarded to Great Western Railway men now serving with His Majesty's Forces may be referred to. Sergt. Henry Williams, Grenadier Guards (for ten years a stower in the Goods Department at Paddington) has been awarded the Military Medal, and recommended for the Distinguished Conduct Medal. Pte. Ernest A. Brewer, Duke of Cornwall's Light Infantry (a member of the Locomotive Department staff at Southall), has been recommended for the award of the Military Medal for gallantry and devotion to duty, in the performance of which he was wounded. Pte. Brewer was for some time a patrol leader in the Boy Scouts movement, and in July, 1912, was presented with a silver medal by the Chief Scout for saving the life of a child from drowning. Company Sergt.-Major T. Bowley, Royal Berkshire Regiment, was employed as a shunter at Old Oak Common. He has previously gained the D.C.M. and the Military Medal, and has now been recommended for a bar to his D.C.M. in recognition of further special services. Lance-Corpl. E. Phillips, Royal Engineers (relaying labourer in the Engineering Department at Newton Abbot), has been awarded the Military Medal for bravery in the field. The Military Medal has also been awarded to Sapper J. H. Perks, who, before joining the Army, was employed by the Great Western Railway as a carpenter in the Engineering Department at Shrewsbury; to Pte. T. E. Clifford (packer, Engineering Department, Tyseley), for conspicuous bravery in the fighting on the Somme on September 15th; to Pte. R. H. Sweet, a member of the Signal Department staff at Newport (Mill Street); to Bombr. A. G. Marsh, R.F.A. (porter in the Traffic Department at Weymouth); and to Pte. J. J. Mumford, Royal Fusiliers (crane lad porter, Goods Department, Brentford). Two other members of the Great Western staff to whom has been awarded the Military Medal for bravery in the field, are Corpl. B. F. Johnson, Duke of Cornwall's Light Infantry (lad office porter, Goods Department, Halesowen); and Pte. H. Aaron, Royal Warwicks (clerk, Goods Department, Hockley). Quartermaster-Sergt. H. O. Peachey, Royal Field Artillery (clerk, Goods Department, Covent Garden Receiving Office, London), has been awarded the Meritorious Service Medal by His Majesty the King in recognition of valuable services rendered during the present war.

Capt. H. T. Rendell, A.S.C. (who, before the war, was assistant in the Motor Car Department at Slough, Great Western Railway), was promoted in October to the rank of Major. He is 29 years of age, and a son of Mr. H. T. Rendell, formerly Great Western Railway Chief Goods Manager, and now General Manager of the Barry Railway. He went to France with the first Expeditionary Force, and took part in the advance to and retreat from Mons. In January, 1915, he was given charge of Advanced Base Workshops, and in the following May was transferred to the General Headquarters and appointed Inspector of Mechanical Transport of the Army in the Field. In June last he was mentioned in despatches for gallant and distinguished conduct in the field.

A Midland Railway employé, Sergt. C. E. McLoughlin, of the Coldstream Guards, has been awarded the Military Medal for bravery on the field at Givenchy. Sergt. McLoughlin, who has been twice mentioned in despatches, was a constable in the Midland Railway police department, stationed at Burton-on-Trent.

Second-Lieut. S. C. Saward, Royal Engineers (draughtsman, Chief Engineer's Office, Great Central Railway), was recently presented with the Military Cross by His Majesty the King. Lieut. Saward has also been awarded the Mlitary Medal.

Activities in the far north have caused much traffic to pass continuously northwards and southwards over the Highland Railway since the outbreak of the War, and as a result, the railway has not been able to spare very many men, especially from amongst the supervisory grades, for service with the Forces. Still, the total number of men who have joined the Colours now exceeds 320, or about 12 per cent. of the staff. Considering the working difficulties which obtain in the case of a railway such as the Highland, especially during winter months, when the line is liable to get blocked with snow in the mountainous districts, such a percentage is very creditable. The list of killed, wounded, and missing, so far as known, is as follows:

Killed	18
Wounded, missing, and prisoners of war	16

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One man (since killed) won the D.C.M. and another the Military Medal.

The following Directors have been on service since the outbreak of the war: Brigadier-General Lord Lovat; Lieut.-Col. J. E. B. Baillie, R.H.A.; Lieut.-Col. E. G. Fraser Tytler, Lovat Scouts; Lieut.-Col. Stuart Fothringham, Scottish Horse; the Duke of Sutherland, R.N.R.

Several items of interest relating to the Caledonian Railway may be mentioned. Sir Charles Bine Renshaw, Bart., Chairman, is Chairman of the Excess Profits Committee, and is on the Scottish Committee on Substitutionary Labour (clerical and commercial) during the War. Lieut.-Col. Harry Walker, C.M.G., T.D., Director, served with the Black Watch, Royal Highlanders, and died as the result of wounds received in action in France on September 27th, 1915; Lieut.-Col. John Gilmour, M.P., Director, is serving with the Yeomanry; Capt. J. Hamilton Houldsworth, Director, is serving with the Army Service Corps; and Colonel John M. Denny, Director, is on the Central Control Board (Liquor Traffic). Mr. Donald A. Matheson, General Manager, is a member of the Railway Executive Committee, which at present controls the railways on behalf of the Government.

The normal staff of the Company immediately prior to the outbreak of War in August, 1914, was about 23,000. The total number of men who joined the Colours up to September 30th, 1916, was 3,486, the departments of the service thus represented being as follows:—

Locomotive Department ..	1,196
Coaching Department ..	848
Goods Department ..	592
Engineering Department ..	438
Canal Department	81
Telegraph Department ..	67
Stores Department ..	33
Head Offices, etc.	231
Total ..	3,486

Particulars as to the number of the Company's employés killed in action, died of wounds or disease, wounded, or who are prisoners or missing, as at September 30th, 1916, are as follows:—

Men killed in action	191
Men died of wounds or disease	46
Men wounded	256
Men prisoners	29
Men missing	35

The following are particulars of Commissions which have been granted to members of the Company's staff:—Capt. Malcolm S. Speir, Assistant Deputy Director of Railway Transport; Capt. Douglas H. Wilson, Assistant Deputy Director of Railway Transport; Capt. Ernest Copestake, Scottish Rifles; Capt. Begg, Royal Garrison Artillery; Capt. Dean, Royal Engineers; Capt. Herbert S. Cleghorn, Royal Engineers, attached to Royal Flying Corps; Lieut. D. McCowan Hill, King's Own Scottish Borderers; Lieut. Leo. Armstrong, Highland Light Infantry; Lieut. Caldwell Anderson, Reserve Battalion, Highland Light Infantry; Lieut. Comyn MacGregor, Railway Transport Establishment; Lieut. G. P. Despard, Recruiting Office, London; Lieut. J. D. Sanderson, Royal Engineers; Lieut. J. E. M. Noad, Royal Naval Division (interned in Holland); Lieut. John King Campbell, Royal Engineers (killed in action); Lieut. Alex. McLean Maitland, Royal Engineers (killed in action); Lieut. John W. Bell, Royal Engineers; Lieut. Robt. G. F. Miller, Royal Engineers; Lieut. Ian R. Fraser, Royal Engineers; Lieut. Ivan T. M. Collins, Reserve Bedfordshire Regiment; Lieut. Andrew Binnie, Reserve Squadron, Royal Flying Corps; Second Lieut. Matthew Wallace, Scottish Rifles; Second Lieut. H. J. Kennaway, Household Cavalry; Second Lieut. R. W. Lees, King's Own Scottish Borderers (killed in action); Second Lieut. W. Kay, Black Watch; Second Lieut. Robert Henderson (not yet placed); Second Lieut. B. J. Pipe, Gordon Highlanders; Second Lieut. James Whytock, Reserve Argyll and Sutherland Highlanders; Second Lieut. Melville Jamieson, Army Service Corps; Second Lieut. Donald K. Webster, Highland Light Infantry; Second Lieut. William E. Shaw, Royal Engineers; Second Lieut. Hugh M. Kitchen, Machine Gun Company; Second Lieut. M. A. Henry, Royal Engineers; Second Lieut. W. Anderson, Royal Engineers; Second Lieut. J. D. Somervail, Royal Artillery; Second Lieut. Robert Alexander, Royal Engineers; Second Lieut. Arch. McIntosh, Royal Engineers; Second Lieut. John Martin, Scottish Rifles; Second Lieut. J. W. McCash, Royal Engineers, attached to Royal Flying Corps; Lieut. A. B. Duncan, Royal Naval Reserve; Engineer Sub.-Lieut. Adam Dick, Mine Sweeper; Engineer Sub.-Lieut. Arch. McElwee, Mine Sweeper; Engineer Sub.-Lieut. Neil S. Forbes, Mine Sweeper; Engineer Sub.-Lieut. Wm. Archibald, Mine

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Sweeper; Engineer Sub.-Lieut. Alex. Hamilton, Royal Navy.

The following is a list of the members of the Company's staff who have gained distinctions :—

Captain Malcolm S. Speir, Railway Transport Establishment. Mentioned in despatches.

Captain Dean, Royal Engineers. Awarded Croix-de-Guerre for services in Gallipoli.

Lieut. D. McCowan Hill, King's Own Scottish Borderers. Mentioned in despatches.

Company-Sergt. Roderick McPhail, Seaforth Highlanders (killed in action). Awarded Distinguished Conduct Medal and French Military Cross.

Sergt. George Guthrie, Royal Scots. Awarded Military Medal and promoted from Corporal to Sergt. for conspicuous bravery.

Sergt. John Port, Highland Light Infantry. Awarded Distinguished Conduct Medal for conspicuous bravery on the field.

Sergt. William Dykes, Dragoons. Awarded the Military Medal for gallantry in the field. Sergt. Dykes, with seven men, held the crater of a mine which the Germans exploded until it became untenable and they had to withdraw, but immediately afterwards he went out alone with a supply of bombs and held the crater for twelve hours.

Sergt. William Smith, Black Watch. Awarded Croix-de-Guerre for carrying wounded officer off the field of battle.

Sergt. James Boyd, Scots Guards, Machine Gun Company. Awarded Distinguished Conduct Medal and also the Military Medal. Sergt. Boyd gained the Distinguished Conduct Medal at Neuve Chapelle, where he worked his machine gun by himself for a considerable time and to such good purpose that a German attack was held up until the arrival of Canadain reinforcements relieved the position. Sergt. Boyd was awarded the Military Medal recently.

Lance-Corpl. William Bell, Black Watch. Awarded the Distinguished Conduct Medal for conspicuous gallantry and devotion to duty at the battle of Loos. He attended the wounded till late in the evening, and then, although himself wounded and suffering great pain, brought another wounded man back to the dressing station.

Pte. John McLaren, Cyclist Orderly, Infantry Brigade. Awarded Military Medal for carrying despatches under shell fire.

Pte. Allan L. Gordon, Gordon Highlanders. Awarded Military Medal for carrying despatches to the front line trenches under deadly shell fire.

Pte. James Ross, Argyll and Sutherland Highlanders (killed in action). Awarded Military Medal shortly before his death.

Chief Steward Wilson Whiteford. Awarded Distinguished Service Medal in connection with operations on Mine Sweeper.

Chief Steward Richard Meek. Awarded Distinguished Service Medal in connection with operations on Mine Sweeper.

Pte. James McFadyen, Black Watch (killed in action). Awarded Military Medal just before his death.

Sapper Robert Fairgrieve, late Gordon Highlanders, and now serving with the Royal Engineers. Awarded Military Medal for conspicuous bravery in the field while serving with the Gordon Highlanders.

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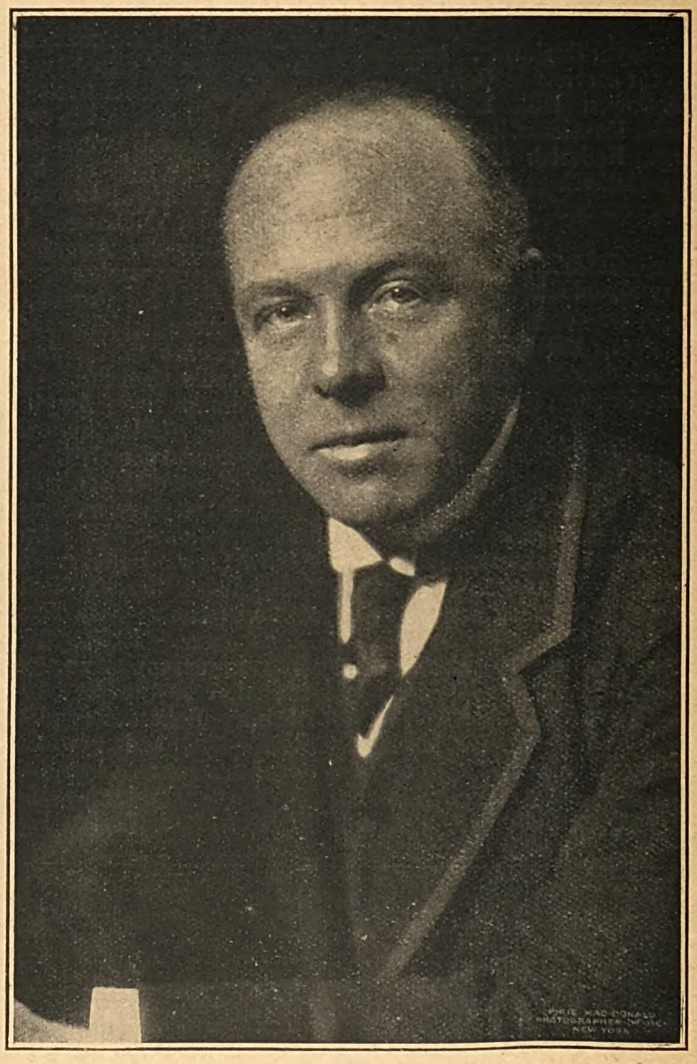
THE RAILWAY PORTRAIT GALLERY.



SIR ALBERT STANLEY.

Managing Director: Underground Electric Railways Company of London, Ltd.
Appointed President of the Board of Trade.

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A Railway President of the Board of Trade.

SIR ALBERT STANLEY APPOINTED A MEMBER OF THE GOVERNMENT.

QUITE a number of railway officers of proved reputation have been appointed to direct and organise important Government engineering departments, and the peculiar capabilities which the higher railway positions afford have been recognised in many ways. But the selection of Sir Albert Stanley, Managing Director of the Underground Electric Railways Company of London, Ltd., and, therefore of the various public transport agencies associated therewith, to be a member of the Government, is believed to be absolutely unprecedented. Moreover, the position in question, that of President of the Board of Trade, is one for which the experience and training of a railway officer peculiarly qualifies; but in Sir Albert's case there is the further factor that he is not merely associated with one section of public transport, but with four distinct forms thereof—urban and local railway, tube railway, motor omnibus and electric tramway—his responsibilities involving, besides the oversight and control of each section, the correlation of all for mutual benefit.

Sir Albert Stanley is still quite a young man of 41, and ranks as the junior member of the Government in regard to age. He is of British birth and parentage, having been born in Derby in 1875; but when quite young went to America and all his training and early experience were obtained there. In the United States he rose rapidly, until he became General Superintendent of the Detroit United Railway and General Manager of the Public Service Corporation of New Jersey.

In connection with the reorganisation of the Metropolitan District Railway, Sir Albert Stanley was selected to be Manager, and later, as various other transport agencies became associated, he was appointed Managing Director of the controlling company. This appointment carries with it the oversight and correlation of the Metropolitan District, London Electric, Central London, and City and South London Electric Railways, of the London General Omnibus Company, of the London United Tramways, and the Metropolitan Electric Tramways, and other agencies.

In this position Sir Albert has proved himself to be the "right man in the right place," and none speak more highly of his capabilities and tactful methods than do the chief departmental officers under him. What he has done for public transport is known to all who reside or do business in or about the Metropolis; and there can be no doubt that the genius which has correlated and organised transport agencies which now convey 971,000,000 passengers per annum, will prove equally effective in the serious matters of trade and industry, and of the transport so essential thereto.

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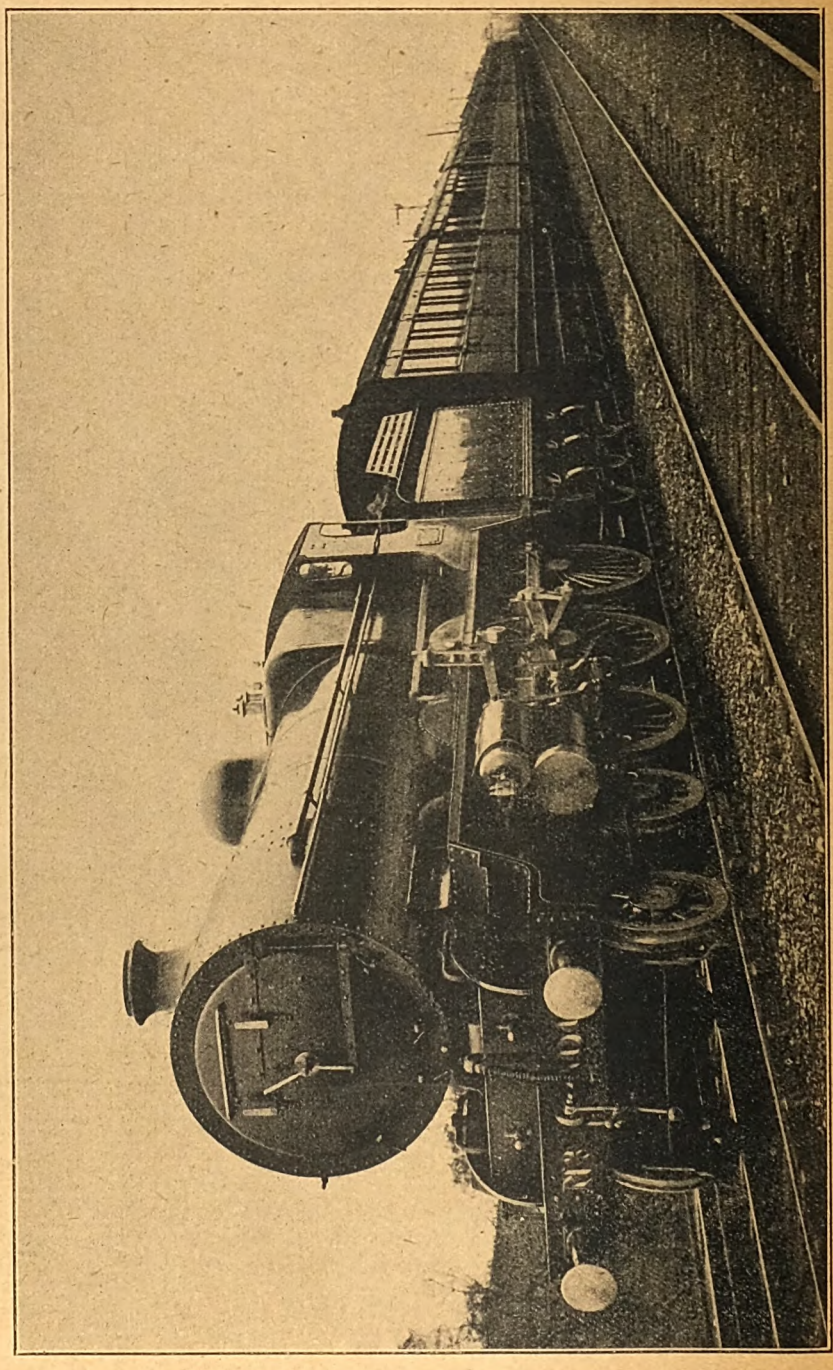
DUBLIN-CORK EXPRESS: GREAT SOUTHERN AND WESTERN RAILWAY.



HAULED BY MR. E. A. WATSON'S BIG FOUR-CYLINDER 4–6–0 SUPERHEATER ENGINE NO. 400, AND COMPOSED OF NEW ROLLING STOCK RECENTLY INTRODUCED FOR THESE TRAINS.

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New Passenger Rolling Stock: Great Southern and Western Railway.

ALTHOUGH the Irish Railways do not appear so prominently as do those of England and Scotland, much of their equipment is of particular interest, and for the principal services essentially up-to-date rolling stock is employed. Reference in this connection may be made to new main line vehicles designed by Mr. E. A. Watson, Locomotive, Carriage and Wagon Superintendent, Great Southern and Western Railway, and built at Inchicore Works.

The new 57 ft. bogie corridor coaches have steel underframes; cylinders are 14 in. diameter by 7 ft. long. The small diameter was adopted in order that the reservoirs might be protected from accident or injury as far as possible by the underframe members. It will be noticed that they are completely protected at both ends by a 7-in. steel channel, forming part of the special truss arrangement. Bogies are of the swing-link type with elliptical springs, built of steel throughout; the body underframe, side and end pillars, etc., are made of teak; the cantrails are pitch pine, and the outside panels baywood.

In third-class carriages compartments and corridor are finished with polished white oak sheeting, 3 in. wide, and teak mouldings. The inside roof is finished with millboard, 3 in. thick, painted white. Accommodation is provided for 64 passengers. Seats and seat-backs are of patent wire, covered with red and black figured velvet. Seats are arranged in frames fitted into wood brackets at the sides, and are capable of being easily removed at any time for cleaning purposes, etc. Lavatories are also finished with polished oak sheeting, and teak mouldings, the floor being covered with a preparation known as "Ryanite," supplied by a Dublin firm. The floors in the rest of the coach are composed of "Sanit" laid on a corrugated iron base.

Electric lighting is Stone's system, each compartment having two 16-c.p. lamps in the centre of the roof. The corridor is lighted at either end by a 16-c.p. lamp, while there is one 16-c.p. lamp over the mirror in each lavatory. Heating is on the Westinghouse system, using steam at atmospheric pressure, regulators being provided in connection with the compartment heaters.

First-class compartments in the tri-composite carriages are finished inside with sycamore panels and mahogany facias. At the side of each compartment there is a bevelled glass mirror, with photographs of scenery on the Great Southern and Western Railway. Seats are upholstered in green cloth, with yellow and green lace and silk cord. Blinds are of green "Rexine" to match the upholstering. The inside roof is formed of arched millboard, covered with figured lincrusta Walton, painted white.

Second-class compartments are finished in a similar manner to the firsts, but with sycamore panels and walnut facias, and upholstered in flowered green tapestry. The inside roof is of millboard covered with lincrusta with morocco surface, painted white. Third-class compartments are finished with white oak sheeting and teak mouldings.

Seating accommodation in these tri-composite vehicles, one of which is illustrated, is distributed as follows:—

First-class	12
Second-class ..	16
Third-class	24
Total ..	52

Electric lighting is on Stone's system. In each first-class compartment there are four 16-c.p. corner lamps, and one 16-c.p. lamp in the centre of the roof. There is one 16-c.p. lamp in the first-class corridor and lavatory. Second-class compartments have two 16-c.p. lamps in the centre of the roof, and one in each corridor and lavatory. The third-class portion is illuminated similarly to the second-class.

The dining saloon, also illustrated, has a large and a small dining compartment, with the kitchen and pantries between.

This coach is adapted for use as a composite dining saloon, or as first-class only, as may be desired. Both compartments are finished

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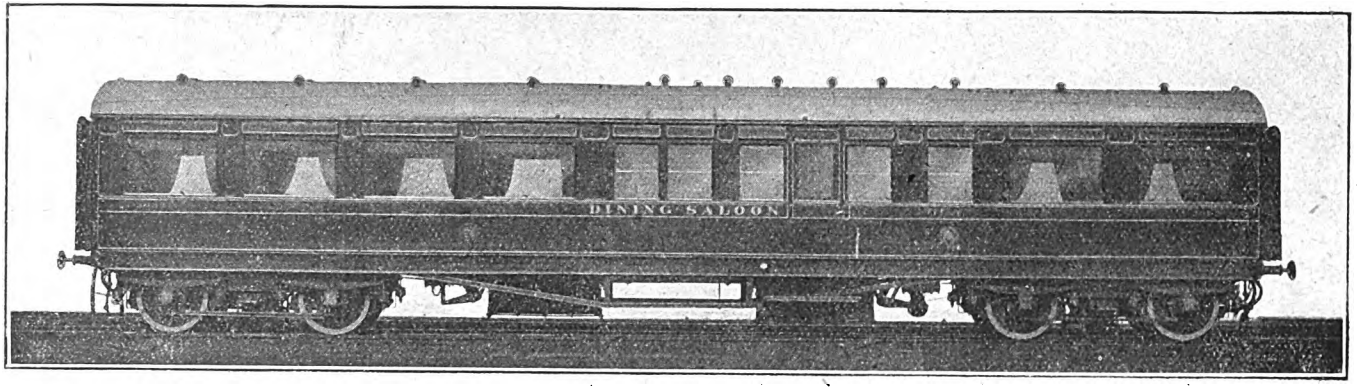
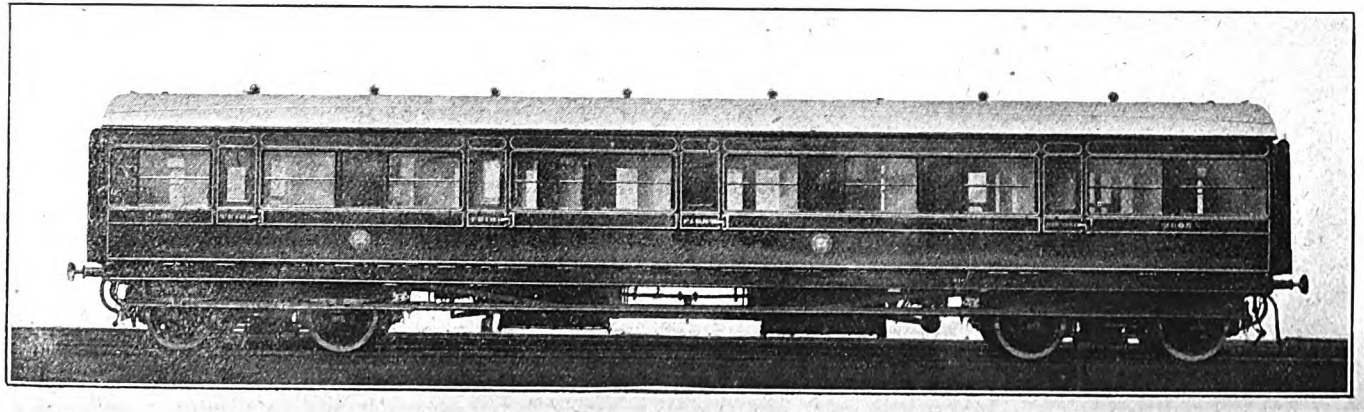
NEW BOGIE STOCK: GREAT SOUTHERN AND WESTERN RAILWAY.

Designed by Mr. E. A. Watson, Locomotive Superintendent, and built at Inchicore Works.



DINING SALOON FOR DUBLIN-CORK EXPRESS SERVICE.



TRI-COMPOSITE MAIN LINE VESTIBULED COACH.

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with bevelled sycamore panels with mahogany centres. Wainscotting under the windows is mahogany vertical sheeting 3 in. wide, with facias of the same material. The inside roof is of millboard covered with figured lincrusta Walton. Dining accommodation is provided for 12 passengers in the small compartment and 24 in the large compartment.

Lighting is again on Stone's system, with four two-light fixtures in the large compartment with 16-c.p. lamps, and in smaller division six one-light 16-c.p. fittings. There are small drop ventilators over the lights in each dining compartment, the renewal of the air being assisted by means of electric fans. The kitchen is fitted with a Slater's stove with nine burners. There are two 16-c.p. lamps.

The pantries are finished in pitch pine sheeting, and are amply provided with tanks, sinks, and all the necessary cupboards, shelves, drawers and receptacles. A 16-c.p. lamp gives light to each pantry. Steam heating pipes are arranged around the sides of the main compartments, with stop valves controlling the supply to each. Flooring is of "Sanit" fireproof asbestos, on a corrugated iron sheeting box, the floors in the compartments being covered with Axminster carpet.

Railway Literature.

RAILWAY MAP OF THE BRITISH ISLES. Each system shown in a distinct colour. Hitherto it has been necessary to pay considerable prices for railway maps on which individual ownership is separately indicated in colour or otherwise; but Messrs. George Philip and Son, Ltd., have now issued a new edition of their well-known railway map of the British Isles wherein the desired object is attained and yet the prices are very moderate indeed. There are large scale insets of the London, Lancashire and Yorkshire, Midlands, Newcastle and Middlesbrough and Edinburgh and Glasgow districts. Scale is 18 miles to the inch, and the size of the map 33 × 43 in.

These maps can be purchased at the offices of the RAILWAY MAGAZINE, or supplied by post, at the following rates :—

On paper, in cover, 2s. net. By post in United Kingdom, 2s. 2d.
On cloth, 3s. 6d. net. By post in United Kingdom, 3s. 8d.
On cloth, to fold in case, 6s. net. By post in United Kingdom, 6s. 6d.
On cloth, varnished, with roller, 7s. 6d. net. By post in United Kingdom, 7s. 11d.

SPON'S ELECTRICAL POCKET BOOK. [E. & F. N. Spon, Ltd. 6s. net, 6s. 5d. post free in the United Kingdom.] Compiled under the direction of Mr. Walter H. Molesworth, M.I.E.E., M.I.M.E., this pocket book collects a wide variety of material useful for reference by electrical engineers. Of principal interest to readers of the RAILWAY MAGAZINE are those sections devoted to railways: particulars of gauges in use, limiting dimensions of vehicles in India, notes on British railway practice and Board of Trade rules, loading gauges, train resistance, tests with electric motor cars and trailers, railway acceleration tests, and several matters affecting electric railway equipment, such as supports for catenary wire (with diagrams), traction systems in use, service conditions, diagrams of electric locomotive types, etc., together with illustrations of locomotives and motors and remarks concerning some of the more exceptional electrification undertakings. There is also a useful collection of tables and data such as the railway electrical engineer requires.

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THE GREAT HALL AT EUSTON: LONDON AND NORTH WESTERN RAILWAY.

AS ARRANGED AFTER REDECORATION.

This fine view of the famous Hall at Euston shows it as redecorated. In the corners below the roof can be seen four of the eight bas-reliefs emblematic of the cities of London, Liverpool, Manchester, Birmingham, Chester, Carlisle, and Northampton, and of Lancashire. In the centre of the floor are coin-freed models (proceeds in aid of railway philanthropic institutions), of engine No. 2222, *Sir Gilbert Claughton*, a Sleeping Car, the King's Royal Saloon, and of the turbine steamer *Greenore*, together with a collection of original letters and documents written by Robert Stephenson and others associated with early railway days. The statue is of George Stephenson.

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The Why and the Wherefore.

For several years a section under this title was a standard feature of the RAILWAY MAGAZINE. *During the intervening period queries have received attention in "Pertinent Paragraphs," or have been replied to by post; but the topics dealt with are frequently of wider interest, and in response to requests from many quarters, it has been decided to reintroduce the "Why and the Wherefore" pages. Readers submitting questions should mark envelopes "Query" in the upper right-hand corner.*

The London "Circles."

Although there is now only one true "Circle" service in operation on the London Underground system, there used to be both "Middle" and "Outer" Circle train services running over portions of these lines, though neither was complete, so that the term "Circle" was only used for descriptive purposes. This explains, however, why the present-day "Circle" trains were referred to as "Inner," and the old title has been retained, especially as it is by no means improbable that eventually the "Outer Circle," and possibly the Middle Circle, too, may be reintroduced. The "Outer Circle" was provided by the London and North Western Railway steam trains which ran from Broad Street *viâ* Hampstead Heath, Willesden Junction, Addison Road, Earl's Court and round to Mansion House. With the electrification of the Metropolitan District Railway they terminated at Earl's Court, until with the introduction of connecting motor trains (now electric) from Willesden Junction to Earl's Court, the through service disappeared entirely. The "Middle Circle" was operated by Great Western steam trains from Aldgate *viâ* King's Cross, Bishops Road, Westbourne Park, Addison Road, Earl's Court and round to Mansion House. This also had to be discontinued with electrification, but has its equivalent, though not by through trains, in the electrified route from Aldgate as far as Addison Road, involving a change at Edgware Road.

[Reply to F. L. HUNWICKE.]

Big Engines and "Banking" Assistance.

Although many of the big modern main line engines *can* take maximum load trains unaided over sections where banking assistance is provided more or less regularly, as, for example, up the Shap incline, London and North Western Railway, up Beattock bank, Caledonian Railway, and out of Queen Street, Glasgow, North British Railway, it does not always follow that it is truest economy to make them do it. For goods trains, and where the most powerful engines are not concerned, it is frequently necessary to provide one or more banking engines at such places; and the engines being there to assist, it may be good policy to use them to relieve the big engines from the full stress of unaided effort, especially if any time lost in stopping for the banker—this is usually detached by a slip coupling automatically at the summit without stopping the main train—can be made up by better speed up the incline. If the superior capabilities of the big engines enables the bankers to be dispensed with, the matter has another aspect; but as a rule the full powers of the main line engines are only called into play to meet special conditions, to provide for the non-availability of the assisting engine, and in cases where it is considered that good average running can be made without unnecessarily straining the engines, and so that one banker will suffice instead of two, or two instead of three.

[Reply to R. WELLING.]

"Piloting" and Engines "Working Home."

Arising out of the foregoing, the question is raised as to big engines, such as the "Sir Gilbert Claughton" class on the London and North Western Railway, being piloted, the instance cited being the use of a 4–6–0 in this way on the Irish Mail express between Crewe and Holyhead. It is true that the load was about 430 tons, but this would hardly call for a big engine to assist on this route, and the probable explanation is that the leading engine was working home or was required at Holyhead, and was sent in this way as the most convenient and expeditious. Occasionally a very heavy train may have two large engines for other reasons, as, for example, if one is not working well, and another big locomotive is the most convenient to send; but the general explanation is that of "working home," and this applies sometimes also for smaller engines.

[Reply to R. WELLING.]

Locomotive Type Nomenclature.

The usual system now is to consider the wheels of the engine—disregarding the tender, but adding T when it is of tank type—as of three classes—leading, coupled (or driving) and trailing—so that three numerals separated by dashes will indicate all ordinary wheel arrangements. In English-speaking countries this is reckoned by wheels, as 4–6–2, but on the Continent the same is usually stated according to axles, the equivalent then being 2–3–1. Type names such as "Atlantic," "Pacific," etc., are purely conventional, and mostly of American origin. Where wheels of any of the three divisions noted are absent, a cipher is used instead of a numeral. For explanatory purposes, a diagram is reproduced. The upper section is concerned only with the wheel types now in regular use. The middle section is devoted to tank engines, while the third portion applies to articulated designs

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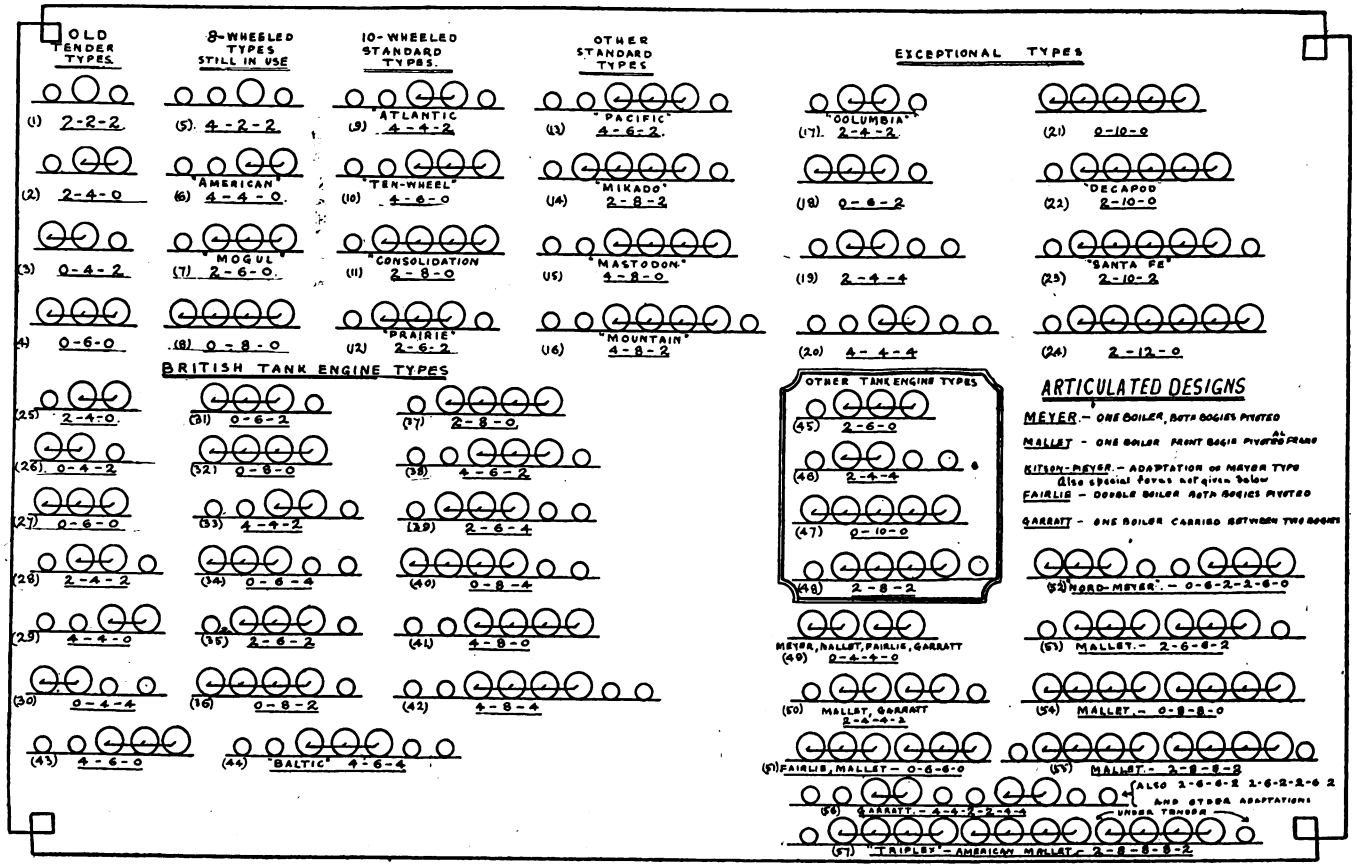
DIAGRAM OF LOCOMOTIVE WHEEL ARRANGEMENTS.

[NOTE.—The engine chimney is supposed to be to the left in all cases.]



Present British standards are: Tender engines—Nos. 4, 6, 7, 8, 9, 10, 11. Tank engines—Nos. 27, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 44. Exceptional—Nos. 13, 40, 41, 43, 44.

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wherein the middle group of wheels has to be duplicated, or the system otherwise modified.

Such references do not, of course, indicate anything else than the wheel arrangement, and quite elaborate codes can be built up to show other features; but for general purposes the numeral system meets requirements sufficiently well. In the case of tank engines, it is sometimes the practice to describe them by the same terms as are used for tender engines having the same wheel arrangement. But as a 4–4–2 tank engine is really the equivalent to a 4–4–0 tender engine, it seems undesirable to describe them as "Atlantic" tanks, as a wrong impression of the characteristics of the engine is thereby conveyed, and we prefer to adopt only the numeral notation, with the letter T added. There is really no need to place the T underneath, thus: $\frac{2\text{–}4\text{–}2}{T}$ as the meaning is quite well conveyed and more conveniently as 2–4–2T.

[Reply to J. K. SMITH.]

The "R. & G." Lever Box.

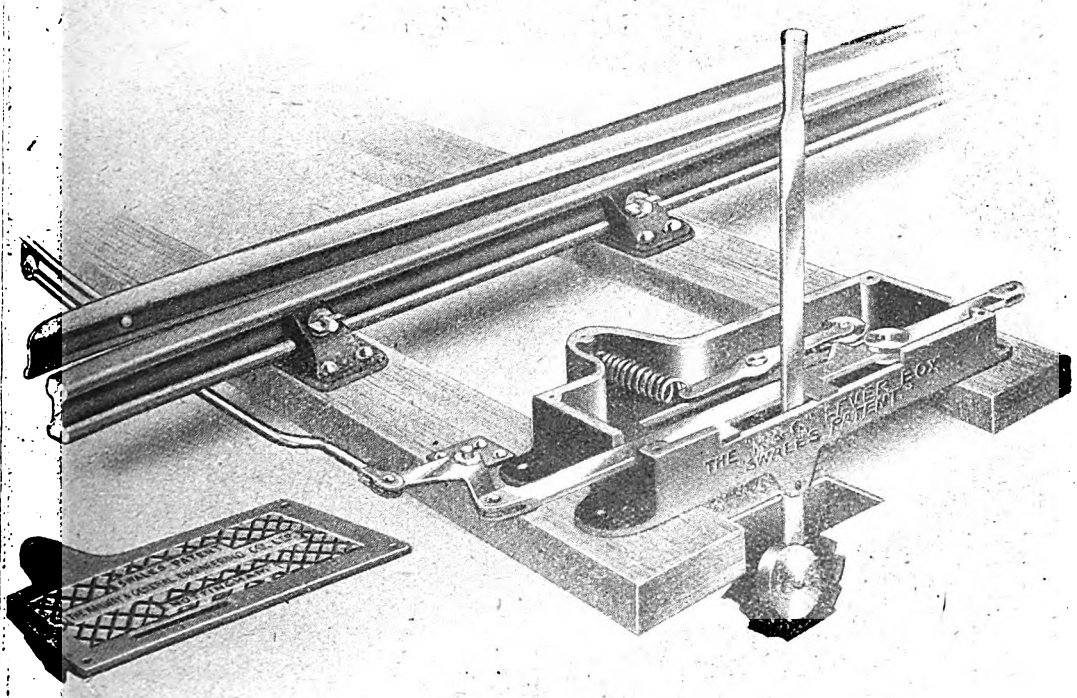
In the coal sidings between Hornsey and Harringay stations, and elsewhere on the Great Northern Railway, also at places on the South Eastern and Chatham Railway, independent point mechanism are employed wherein the point levers always occupy a vertical position when not in use, whichever way the points are lying. This mechanism is known as the "R. & G." lever box, Mr. F. Swales' patent, and action is as follows:—The points are operated automatically by the wheels of an engine, truck, etc., entering the heel thereof, thus preventing the same taking two roads when setting back, and although the same engine or truck, etc., may pass through the points at excessive speed there is not the slightest jar or movement on the casting or lever, the latter always hanging free in a vertical position by the action of the counterbalance weight on the lower end.

The apparatus is supplied by the Railway & General Engineering Co., Ltd., Nottingham.

[Reply to F. L. HUNWICKE.]

Simple and Compound Locomotives.

To those who can recall the days when the locomotive world was considerably exercised in regard to the vexed question of simple *versus* compound, it appears strange to notice how practice has settled down to the plain, straightforward question of which is best to meet the particular traffic demands. It is true that even now there are differences of opinion as to whether it is not desirable, in the interests of efficiency, to get all the work out of the steam by using it first in one cylinder (high pressure) and then passing it, with a considerable work value still remaining in it, to a second cylinder (low pressure), where further work is done before it passes away to exhaust. The alternative is to obtain as much power as possible out of the



THE "R. & G." LEVER BOX.

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steam in one cylinder, and then exhaust it; hence the term "simple" as against the two-stage practice of compounding. High-degree superheating has been largely responsible for the general settling down to "simple" or "non-compound" working, as the reserve of heat in the steam allows of the practicable full working value being realised within the expansive limits of one cylinder. Therefore the vast majority of British engines, and all new designs for several years past, have had "simple" cylinders, though in some there are three or four of these instead of the usual two only. Opinion abroad is, however, divided as to whether it is not desirable, even with superheated steam, to adopt compound principles, and there are many foreign engines, particularly in France, where the steam is used first in two high-pressure cylinders and then in two using the low-pressure steam, and therefore of larger diameter, as the steam has considerably expanded with its reduction in pressure and a larger piston area is necessary to obtain a substantially equal work value. For large articulated engines, it is the general practice to employ compounding, but for general work simple practice is now more often adopted.

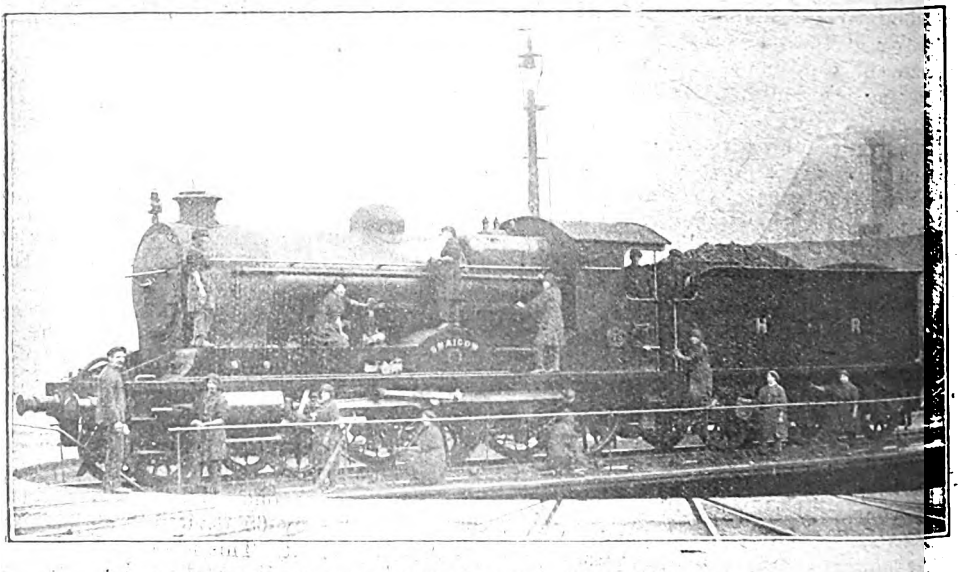
It is necessary, however, to remember that compound engines have, in the past, had many records to their credit, and there are numerous compounds in Europe still doing splendid service, some of them entirely up-to-date, while in the United Kingdom it is necessary to acknowledge the fine work done by the 40 compounds on the Midland Railway (4–4–0 with one high-pressure and two low-pressure cylinders driving one axle), the five 4–4–2's on the Great Central Railway (a similar arrangement, but the H.P. cylinder operating one axle and the two L.P. cylinders another), the French four-cylinder compounds on the Great Western Railway, Nos. 1300, 292 and 1429 on the Great Northern Railway, Nos. 730 and 731 on the North Eastern Railway (all of the 4–4–2 type, with two H.P. cylinders actuating one axle and two L.P. cylinders operating another coupled with it), and a few other engines, including the remaining Webb four-cylinder 4–4–0 compounds (two H.P. and two L.P.) and the three-cylinder (two H.P. and one big L.P.) 0–8–0 engines on the London and North Western Railway, and the two-cylinder compounds (one H.P. and one L.P.) on the Belfast and Northern Counties section of the Midland Railway in Ireland.

[Reply to E. J. PEARCE.]

War Traffic Railway Connections.

Since the outbreak of war a number of new railway junctions have been put in to facilitate the working of trains from one railway to another. Thus at Gospel Oak a double-line junction has been made by extending the Great Eastern Railway lines through to join those of the London and North Western Railway, whereas before there was no rail connection whatever, though many passengers changed from one side to the other. Another new connection is that provided between the Great Northern Railway main line near Harringay and the Tottenham and Hampstead Junction line. This gives connection only on the down side of the latter, and is therefore apparently only used for occasional special requirements. Its value is, however, considerable, as a very roundabout route would otherwise be necessary for transfer purposes.

[Reply to F. L. HUNWICKE.]



WOMEN ENGINE CLEANERS ON THE HIGHLAND RAILWAY.

(*For particulars of this engine see p.* 10.)

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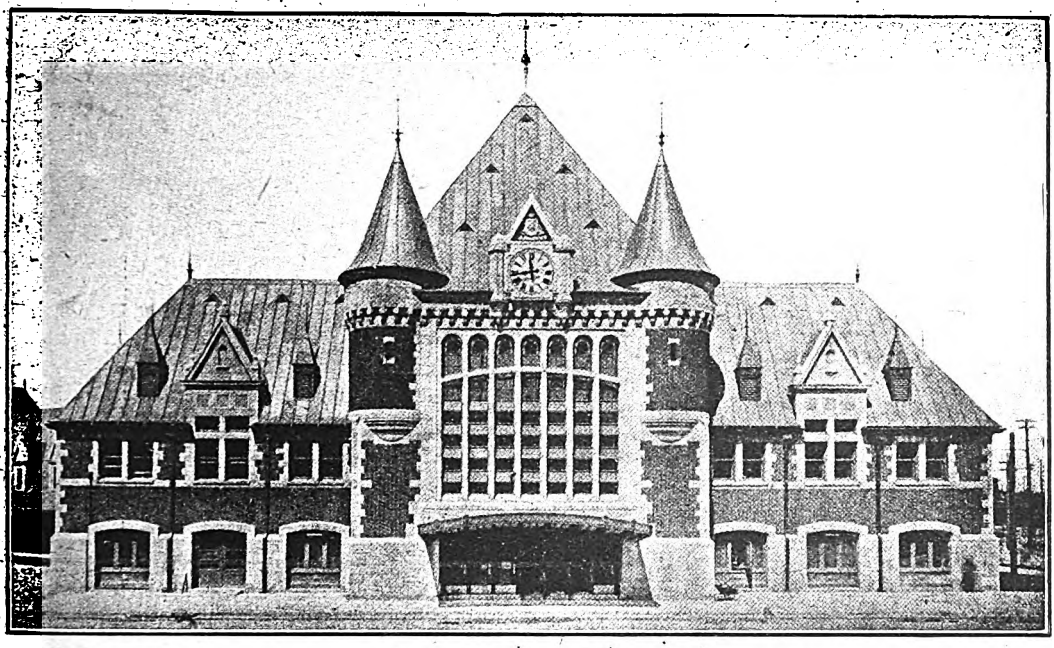

NEW PALAIS STATION, QUEBEC: CANADIAN PACIFIC RAILWAY.

French Architecture on a Canadian Railway.

QUEBEC, with its historic associations, its quaint old houses, its convents and churches, its fortifications and its narrow and winding streets, is more like the cities of the Old World than any other on the North American Continent. Consequently in designing the building for the New Palais station (Gare du Palais), the Canadian Pacific Railway have adopted a style of architecture which harmonises well with that of the Chateau Frontenac. It is, in fact, an adaptation of that of the famous French Chateaux of the Loire.

The new station is located at the corner of St. Paul and Henderson Streets, just north of the old station and near the site of the Palace which Bigot, the Intendant of Nouvelle France, erected for himself shortly before the downfall of the French régime. The building itself consists of a central block with two wings, the central portion having a superficial area of 142 ft. by 65 ft., and the two wings of 130 ft. by 44 ft. respectively. The exterior is faced with Argenteuil granite, Deschambault limestone and Citadel brick, all local products, and the steep, sloping roofs are covered with copper. The main entrance is flanked on either side by a tourelle, and is protected by a glass and iron marquise, which extends the full width of the sidewalk; over it is a large window, and above that an illuminated clock with a 72 in. dial, which forms one of the principal features of the façade—the pediment immediately over the clock bears the arms of the City of Quebec.

The old Palais station is at present being taken down to make room for the plaza which, with an area of 350 ft. by 285 ft., will form the foreground of the new building, and afford a splendid view of its architectural perfections as well as giving visitors to the city a very favourable impression on their arrival by train. Through the plaza runs a 60 ft. roadway, flanked by sidewalks, and it will be beautified by grass plots, shrubs, Lombardy poplars, and ornamental lighting standards.

Passing through the main entrance and vestibule, from which stairs lead to the second storey, one reaches the ticket lobby, 45 ft. wide by 65 ft. long, and rising to a height of 60 ft. This lobby is finished with grey tapestry brick walls, a Lepanto marble base, faience cornices, etc., and a sloping

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mosaic ceiling which has a large leaded glass window in the centre, displaying in their proper colours the arms of the several provinces and a map of the Western Hemisphere with the Canadian Pacific lines well shown. The ticket offices are on the right side of the lobby; between them and the main entrance the information bureau, and on the opposite or left side are the baggage, checking, and parcels rooms, Canadian and United States customs, telephone booths, and the telegraph office.

On the left side of the concourse, three sets of gates open to the midway and the tracks, of which there are eight leading directly to and from the station. On either side of each gateway a mechanical indicator shows the track number, departure time and destination of each outgoing train. The baggage department and the Dominion Express Company have ample accommodation in the wing extending from the left of the main entrance.

The second floor of the main building, in addition to providing office accommodation for the city passenger and freight agents and the operating department officials and rooms for the conductors and train-men, will contain also a museum of interesting and instructive exhibits in Canada's natural resources, which will be open to the public. These offices and the museum surround the ticket lobby, and are separated from it by open arches and a balustrade of artistic design.

The large window over the main entrance displays in colour the arms of seven men who figured large in the early history of Canada and of Quebec itself—viz., Montmagny the successor of Champlain and first Governor of Canada, 1636–1647; De Tracy, Viceroy in 1665 and conqueror of the Iroquois; Beauharnois, Governor 1726 to 1747; Montcalm and Wolfe, the famous French and English generals who both fell with honour in the battle which decided that Canada was to belong to Great Britain; Frontenac, Governor 1672 to 1682 and again 1689 to 1698; and Talon, the first Intendant, 1665–1672.

The building was designed by Mr. H. E. Prindle, architect, of Montreal, and erected by the Downing-Cook Company, also of Montreal, under the supervision of Mr. D. H. Mapes, Canadian Pacific Railway engineer of buildings. It rests upon a foundation of 430 concrete piles, and in its construction 400 tons of structural steel, 2,000 yards reinforced concrete, 400,000 common brick, 75,000 exterior face brick, 125,000 interior face brick, and 10,000 c. ft. of exterior cut stone were used. There is not much woodwork in the building, but what there is is Canadian birch, in accordance with the Company's policy of using Canadian woods exclusively for its buildings and cars. Local labour and material were employed wherever possible.

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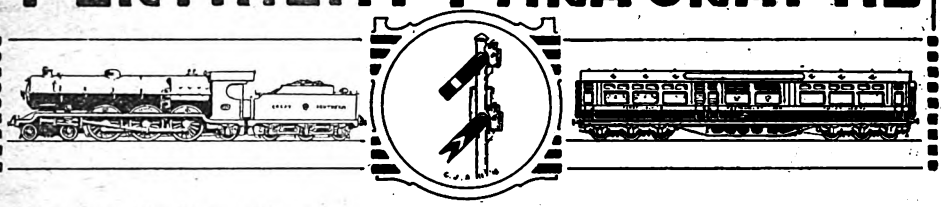
PERTINENT PARAGRAPHS



War Time Traffic Regulations.

PRELIMINARY announcements indicate that the New Year will witness drastic reductions and modifications of train services in national interests, and that there will be restrictions by measures to be promoted under the Defence of the Realm Act, upon the freedom which at present exists in regard to railway travel, including possibly fare increases for certain sections of traffic. It is too soon to discuss these in detail, but they will also apply on the goods side, the principal factor being that certain statutory requirements upon railway companies, will be modified so that desirable action can be taken where justified, and regardless of such restrictions.

The Board of Trade has issued the following announcement :—"The increasing demands made by the war on the resources of British railway companies call for the utmost economy in the employment of staff and rolling-stock."

"(1) While the conveyance of troops has thrown an enormous burden on the railways, civilian traffic has diminished little, if at all, and the time has come when every person proposing to travel by train should consider whether it is really necessary that the journey should be undertaken. The Government would be reluctant to take any steps in the direction of a general interference with railway travel, and the possibility of any such action may be made more remote if members of the public will individually bear in mind that every journey not of genuine necessity should be avoided in the interests of the country."

"(2) The Board of Trade desire also to impress upon all traders the urgent importance of taking every step in their power to avoid delays to wagons both in loading and unloading. The saving of a day all round means in effect a substantial addition to the rolling-stock of the country. Economy and dispatch in the use of sheets for covering wagons are also of great importance. The heavy and urgent demands for the conveyance of vast quantities of war material render some delay to other traffic inevitable. The Board of Trade have urged the railway companies on their part to adopt all possible measures to expedite the handling of the traffic, and they rely on the traders to co-operate with the companies in dealing with the difficulties that must necessarily arise."

The maximum weight of individual parcels sent by passenger train has now been fixed at 112 lb.

Keadby Bridge: Great Central Railway.

ON page 63 of the July, 1916, RAILWAY MAGAZINE is a view of this notable work. Mr. J. B. Ball, Chief Engineer, Great Central Railway, has since read a paper before the Institution of Civil Engineers, describing the undertaking, and the following extracts may be quoted :—

This structure consists of a combined railway and roadway bridge of five spans of the following dimensions :—Two fixed river spans of 135 ft. each ; a lifting span of 160 ft., giving a clear waterway of 150 ft. ; a track span of 40 ft. on which the lifting span rolls, and an approach span of 70 ft. on the east bank of the river. The bridge has a width of 53 ft. 6 in. between the centres of the outside girders, of which 29 ft. 3 in. is occupied by the railway and 24 ft. 3 in. by the roadway ; each span consisting of three main girders, the centre one dividing the roadway from the railway. Four river piers are faced with granite and founded on rectangular steel caissons filled with concrete and sunk under compressed air to a depth of 50 ft. below low water. The largest of these caissons has an overall length of 94 ft., a width over cutting edges of 20 ft., and a permanent height of 32 ft.

The two fixed river spans are similar in design, the main girders being of the ordinary N type, 17 ft. in depth, divided into ten panels and counterbraced in the two centre bays. The cross girders are suspended from the vertical posts below the bottom booms and spaced 13 ft. 6 in. apart ; between them ordinary roadway and railway stringers carry the deck plating. The top booms are connected by portal bracings at each vertical post, intersected by diagonal wind-bracing, and provision for longitudinal expansion is made at the junction of the spans by means of cast-steel bearings mounted on groups of rollers. The total weight of steelwork in each of these spans is 540 tons. The three main girders of the track span form a path on which the Scherzer lifting span rolls, and together have to sustain its weight, which is nearly 3,000 tons. These girders, which are of very heavy construction, have an effective length of 40 ft. and a depth of 10 ft., and carry on their upper flanges cast-steel plates, 3½ in. thick, on which the teeth are formed, engaging with corresponding slots in the segmental girders of the lifting span.

The Lifting Span.

The lifting span is counterweighted at the rear end in order to secure balance at all angles of lift, the counterweight consisting of a rectangular steel shell extending across the full width of the bridge, and heavily braced internally by

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lattice frames and strengthening girders. Its internal capacity is 24,780 cub. ft., and it contains 1,800 tons of concrete. The total weight of steelwork in the lifting span is 987 tons, exclusive of the machinery and gearing, and the total weight of the moving span, together with its counterweight, is approximately 2,920 tons.

For operating the lifting span two 115 H.P. direct-current motors, carried on the leaf itself, are employed, power being transmitted through trains of gearing to the main pinions on each side. The angle of maximum elevation of the bridge when fully open is 81°51, and the time taken to open or close it by electrical power is less than 2 min. Owing to the absence of power in the neighbourhood, a special plant for the generation of current had to be put down, consisting of two direct-coupled petrol engines driving two 50-kilowatt continuous-current machines, the current being delivered at the switchboards at 220 volts. A large storage-battery is provided, capable of supplying the motors with current for about 30 operations of the bridge before recharging is neccessary. Two sets of electric brakes are provided, and at the fore end of the span two heavy forged steel bolts, worked electrically from the control cabin, engage with castings anchored down to the pier, so locking the bridge when in the "Down" position.

To prevent too rapid descent of the leaf as it comes down on to the bearings, a pneumatic buffer is provided at the front of the span, whilst at the rear end bumping-blocks are provided on to which the counterweight comes down when the leaf attains its maximum elevation. Adjacent to these blocks, hydro-pneumatic buffers are fixed, the rams of which, coming into contact with the counterweight, bring the bridge gradually to rest as it reaches its final position.

In order to meet the requirements of the Navigation Authorities, the lifting span was erected in a vertical position, ten months being occupied in this work. Electrically operated gates are provided for the protection of roadway traffic, which are interlocked with the railway signals, and are the first three-position signals to be installed as a complete scheme in this country. Work was commenced in August, 1912, and following the Board of Trade tests which were carried out in March and April, 1916, the bridge was opened to traffic on May 21st.

Railway Bills in Parliament: 1917.

It could not be expected that railway projects would figure at all prominently in the Parliamentary work for 1917. Indeed, there are only three actual railway bills, with three promoted by industrial firms and others for short lengths of railway. The most important of the first three is, of course, that of the South Eastern and London, Chatham and Dover Railways, rendered necessary by the action of the House of Commons last year in throwing out the proposals for strengthening Charing Cross railway bridge in view of various schemes, which might mature some years hence, for improving London and which might include the removal of the railway bridge altogether. As the strengthening of the bridge is imperative, and the alternatives are not only indefinite but certain of non-accomplishment for some years ahead, the railway companies concerned are forced to introduce their bill again, and it is hoped that, this time, saner counsels will prevail.

The Mansfield Railway asks for further powers rendered necessary by the virtual completion of their line, and to enable arrangements to be concluded with the Great Central Railway. The Cheshire Lines Committee's bill relates principally to Throstle Nest tunnel, and to the removal of restrictions upon their improvement works there imposed by powers held by the Manchester Corporation. Certain detail powers and the like are associated with these bills, but need not be set out here. Remaining bills are for industrial branches and connections with existing railways, and are promoted respectively by Messrs. Levinstein, Ltd., Armstrong, Whitworth & Co., Ltd., and the trustees of the Trafford Park estates, all in the Manchester area.

The Central Argentine Railway and the War.

In sending a copy, Mr. Harold Torre, Editor, *Central Argentine Railway Magazine*, writes:—"Our November issue is specially dedicated to our 400 Central Argentine Volunteers with the Colours." Contents include a facsimile letter by the General Manager, reading as follows:

> To you, my one-time helpers, who now work for England in other ways, I send a Christmas greeting. May the New Year bring to you the fulfilment of your hearts' desires, and grant to me the honour I most would wish for—to offer you welcome, in pride and in gratitude, on a safe return to the scene of your peace-time labours. C. H. Pearson.
>
> Buenos Aires, October 24th, 1916.

We may quote from the honours list at present to the credit of Central Argentine Railway men: The late Captain W. J. N. Glasgow was mentioned in despatches for his work on the Gallipoli peninsula, and afterwards awarded the Military Cross for bravery shown on the Western front. Lieut. J. Wilson (Accountant's Department) won the French "Medaille Militaire" for fine work with the R.A.M.C. in the Dardanelles. Trooper S. E. Warner, of King Edward's Horse (Traffic Department) was highly commended for an act of courage referred to in "Routine Orders" by General Sir Charles Munro, K.C.B., commanding the First Army. Lieut. E. E. Haines, King's Liverpool Regt. (Admin.) has been awarded the Military Cross, and received the thanks of the General Officer commanding the Forces at Salonika for special reconnaisance work. Corpl. J. J. A. Esslemont (Traffic) has been specially commended by his commanding officer. Corpl. C. W. Smith has been awarded the Military Medal. Lieut. J. V. Holland, of the Chief Mechanical Engineer's Department, has been awarded the Victoria Cross.

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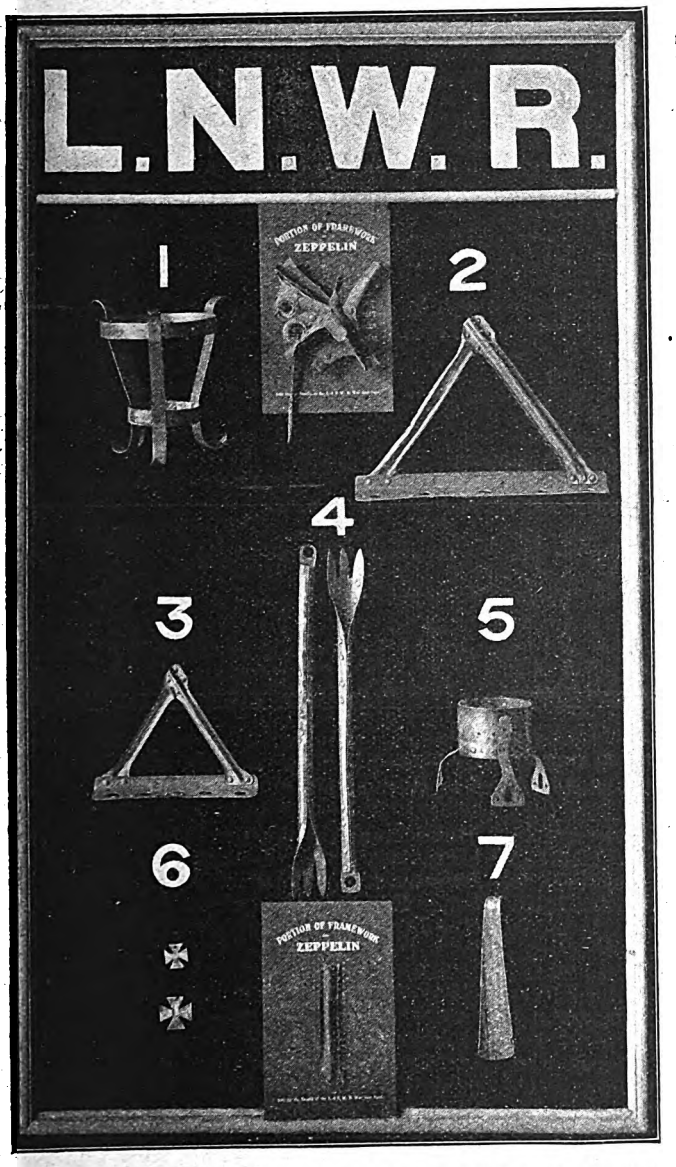
Out of the grand total of 394 Central Argentine Volunteers, an even hundred have earned commissions, these including one Major, 16 Captains, and 81 Lieutenants. Non-commissioned officers already amount to over two score, whose death roll amounts to 19. A large number of the men have joined the Royal Engineers, some 78 all told, whilst the Army Service Corps comes next with 39.



ZEPPELIN RELICS FOR WAR FUNDS, LONDON AND NORTH WESTERN RAILWAY.

Zeppelin Relics for London and North Western Railway War Funds.

In order to assist funds for establishing cheerful homes for such London and North Western Railway men as may be totally disabled in the War, a quantity of Zeppelin *débris* given by the War Office to the London and North Western Railway, has been converted into useful and souvenir articles, and some are illustrated on this page. The aluminium girders lend themselves admirably towards fashioning toasting forks, pipe racks, fern pot holders, shoehorns, "Iron Crosses," etc., whilst other portions are mounted as souvenirs on cardboard. It will be noticed that special efforts have been made to maintain the identity of the origin of each article, and it is stamped showing it was manufactured from a fallen Zeppelin. Full particulars of the price of these can be obtained by RAILWAY MAGAZINE readers from the General Manager's Office, Publicity Department, 7, Euston Square, London, N.W.

No. 327, Charles Macrae: London, Brighton and South Coast Railway.

SINCE the painting for our colour plate of this engine — presented with the November number—was prepared, certain detail alterations have been made, in order to bring No. 327 into line with improvements which will appear on the next series of this type, now in process of construction. The Westinghouse pump, and also the Weir pump, have been placed between the frames, the former being in front of the cylinders as on the "Atlantic" tender engines, and the latter behind the cylinders. The tank-filling hole lid has been lowered for convenience in handling the water crane hose, and the exhaust steam domes are removed.

Curiosities of Locomotive Numeration.

PARTICULARS continue to arrive of locomotive coincidences and curiosities of numeration. In sending two excellent photographs, Mr. F. Roberts points out that one, reproduced on page 70, shows 4–4–0 engines Nos. 294 and 295 outside Friary shed at Plymouth, London and South Western Railway. These two engines, of Mr. Drummond's first 6 ft. 6 in. design with fire-box water tubes, have been stationed at Friary for a considerable time past, and Mr. Roberts mentions that he has occasionally seen them together on the same train.

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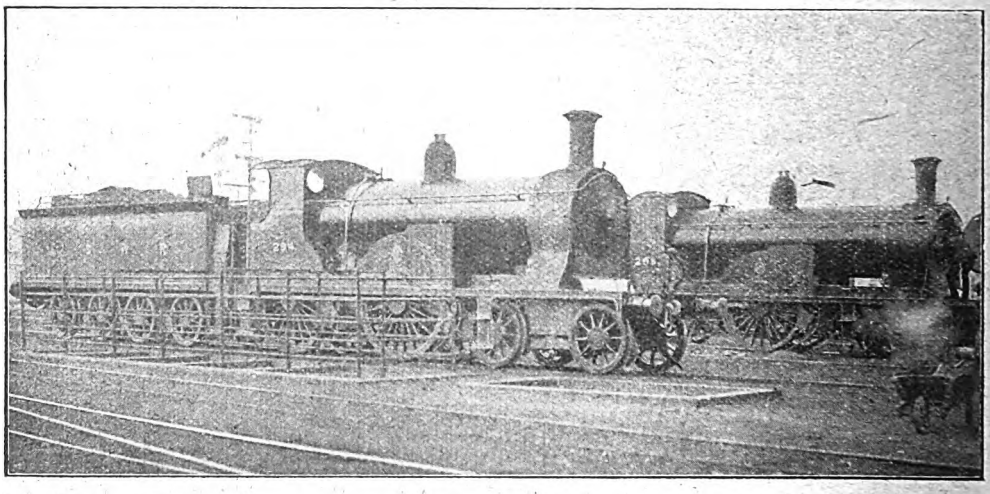
At Romsey he recently noted Nos. 296 and 297, of the same class, standing together. In the Plymouth district he has also observed several Great Western Railway coincidences of the same class. For example: Nos. 3379 *River Fal* and 3380 *River Yealm*, 3376 *River Plym* and 3377 *Penzance*, 3252 *Duke of Cornwall* and 3253 *Pendennis Castle*, and 3357 *Trelawny* and 3358 *Tremayne*. In some cases these were the numbers borne before renumbering.

Further, Mr. Roberts refers to engines of the same number but belonging to different railways, citing No. 251, London and South Western Railway, and No. 251, London, Brighton and South Coast Railway, standing together at Guildford, while at Fratton sheds, Portsmouth, engines of the same two railways which are numbered 546 can be frequently seen close together, particularly on Sundays.

to. Mr. Lysaght mentions that near Oxford he noticed London and South Western Railway 4-6-0 engine No. 334 (of Mr. Drummond's first four-cylinder six-coupled class) hauling a goods train composed entirely of Great Western wagons and with a Great Western Basingstoke brake van.

Mr. G. Milne writes that Midland engines now work through to Edge Hill (Liverpool) from the Cheshire Lines system and over the London and North Western Railway, *viâ* Hunt's Cross West and Allerton Junctions. Also that London and North Western engines now work over the Great Western Railway from Chester to Whittington, and Great Western engines over the London and North Western Railway to Rhyl. Great Western locomotives travel over the joint line and over the London and North Western and Lancashire and Yorkshire Railways to Southport, *viâ* Wigan



Photo] [*F. Roberts.*

LONDON AND SOUTH WESTERN RAILWAY.

4-4-0 engines Nos. 294 and 295 photographed together at Friary sheds, Plymouth.

Mr. D. R. Lysaght corrects his reference to Great Western Railway French compound 4-4-2 engine No. 103, *Alliance*, pointing out that the correct number is 104. This has also been pointed out by several readers. Mr. W. L. Kenning mentions that he once took a photograph of two trains passing near Abingdon Road, Great Western Railway, one being the 4.45 p.m. *ex*-Paddington, headed by No. 102, *La France*, and the other the 3.42 p.m. from Wolverhampton, with No. 104, *Alliance*. Recently at Radley he noted No. 2331 on a down goods train, and the next to follow was No. 3321, *Brasenose*, running light. On another occasion two goods trains passing were hauled respectively by Nos. 673 and 674, both 0-6-0 engines.

War Time Traffic Working.

KEENNESS in this topic is by no means diminishing, judging from the number of letters wherein unusual features of traffic working are referred

Junction, and likewise travel between Chester and Shrewsbury over the London and North Western Railway, *viâ* Whitchurch. He has also noted a South Eastern and Chatham goods brake van on a London and North Western goods train as far north as Wavertree, making for Edge Hill, Liverpool.

Mr. G. H. Cannon recently noted a Hull and Barnsley Railway passenger coach at Cheltenham, Midland Railway. Mr. F. C. Greenwood, only a few days since, remarked a train of North Eastern Railway vehicles at Farringdon Street station, on the Metropolitan Railway widened lines, hauled by a Great Northern 0-6-2 tank engine, while about three months ago he saw a Midland goods train at Mill Hill piloted by a Hull and Barnsley 0-6-0 engine. The latter was apparently one of those now engaged on the South Eastern and Chatham Railway, as he found the same engine two months later at Paddock Wood.

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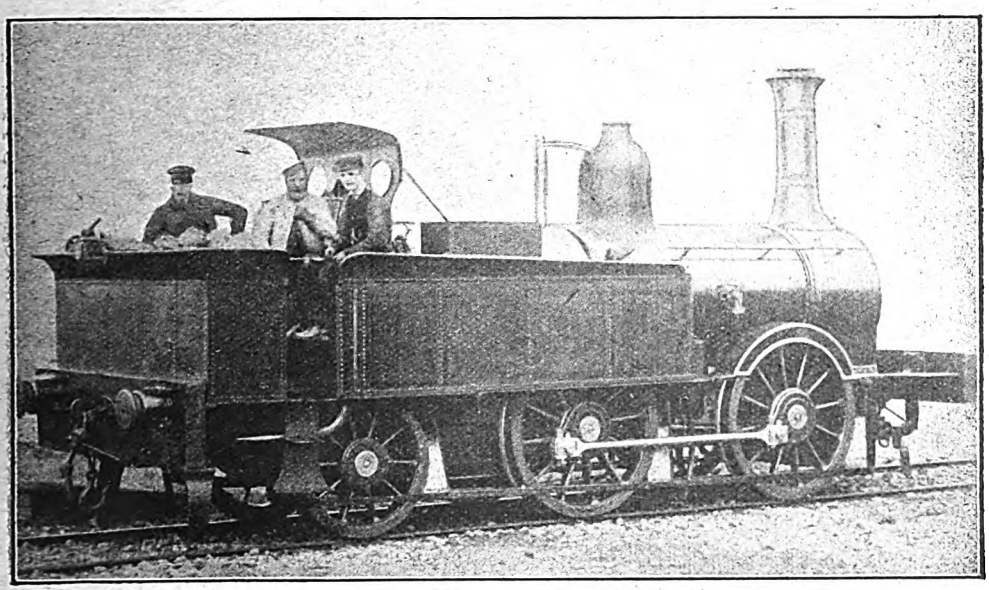
Characteristics of Locomotive Design.

ARISING out of comments in the November number as to similarities between the Drummond engines on the London and South Western Railway and the Caledonian engines of about 1890, a Glasgow reader, Mr. F. McInnes, suggests some ingenious derivations, tracing back the Drummond features to Mr. William Stroudley. He points out that Mr. Dugald Drummond left Brighton for the North British Railway in 1876, and went to the Caledonian Railway in 1882. Thence he transferred to the London and South Western Railway in 1891. Mr. Peter Drummond went from the Caledonian to the Highland Railway, and now has charge of the Glasgow and South Western Railway at Kilmarnock. Mr. McInnes, therefore, traces the Stroudley influence from the London, Brighton and South Coast Railway—one might go further back, to Mr. Stroudley's work on the Highland Railway—*viâ* Messrs. Dugald and Peter Drummond, to the locomotive practices of the North British, Caledonian, Highland, Glasgow and South Western and London and South Western Railways. He also mentions the similarities between Mr. Manson's engines on the Great North of Scotland and Glasgow and South Western Railways.

Comparisons of this class are, no doubt, noteworthy, and seeing that every engineer must be influenced by his training and environment, besides which, if he is a real live personality he will certainly have his own views as to what is desirable practice, there must be many ways in which such influences will show themselves.

In the same way, one can trace the Worsdell influence on the Great Eastern and North Eastern Railways, and that of the brothers Stirling on the Glasgow and South Western, Great Northern, South Eastern and Hull and Barnsley Railways. But it does not do to lay all the stress upon the similarities, and an analysis of many of the engines in question indicate very decided development and "individualistic" design, and only a semblance of "copied" designs. The fact is, that these engineers have carried with them the results of their experience, and naturally adopt features which they have found of proved value; while in regard to details they have allowed their personal preferences to hold sway where there has been no adequate reason why they should not do so, or there may be good grounds for so doing.



0–4–2 TANK ENGINE, BRISTOL PORT AND PIER RAILWAY.

The Bristol Port and Pier Railway.

A BRISTOL reader, Mr. F. Lawrence, sends a photograph (reproduced) of an engine belonging to the old Bristol Port and Pier Railway, a short railway which ran along the Gloucestershire bank of the River Avon from Clifton station (now named Hotwells) to Avonmouth, a distance of 6 miles. The line was opened for traffic in 1864 with stations at Clifton (the Bristol terminus), Sea Mills, Shirehampton, Avonmouth Dock and Avonmouth. Two locomotives were purchased, it is understood, from the Stockton and Darlington Railway and were stabled at Shirehampton. The other rolling stock consisted of about 20 four-wheeled coaches, and about 6 goods wagons. The goods wagons were attached to the rear of the

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passenger carriages as occasion required. The engines were not fitted with the vacuum brake apparatus and trains were controlled entirely by hand brakes operated by the enginemen and guard. When the Bristol Port and Pier Railway was taken over in 1890 by the Great Western and Midland Companies the two engines were sold to a colliery company in South Wales where they did useful work for some years. Mr. Lawrence also quotes the following extract from Arrowsmith's Dictionary of Bristol:—"The Bristol Port and Pier Railway Company was incorporated by Act of Parliament, July 17th, 1862. The line runs from Hotwells (under Clifton Suspension Bridge) to Avonmouth, with stations at Sea Mills and Shirehampton. Commenced February 19th, 1863, opened for traffic March 6th, 1864. On the construction of the Clifton Extension Line to Sneyd Park by the Great Western and Midland Boards, the two companies acquired running powers over the Port Railway and Pier Company's line as between Sneyd Park Junction and Avonmouth, and eventually (in 1890) the Great Western and Midland Railway Companies jointly purchased the whole of the line, which then became part of the Clifton Extension Joint Railway."

The 481 Class: Great Western Railway.

In regard to Mr. Robson's remarks published last month, Mr. Ahrons writes: "Referring to Mr. Robson's remarks on pages 287-8, I saw all the 481 class rebuilt at Swindon, and of these 483, rebuilt in January, 1887, was the first. I have a note taken at the time that the pressure was 150 lbs., but I cannot at the present moment say whether any of the later ones had 160 lbs. Mr. Robson is, of course, correct in stating that the through coaches to the north from stations west of Exeter were not introduced until 1892, when the gauge was altered. I intended to refer to the service generally until the end of the century, but regret having made it appear as if these coaches were put on in 1888, which was, of course, impossible. I think Mr. Robson will find on enquiry that the 'wool special' express mentioned by him ran between Bristol and Bradford, and not Leeds. I saw it leave Bradford for Bristol on one occasion (either 1888 or 1889) at that period, when it was worked through from Bradford to Shrewsbury by London and North Western engine 1679 *Bunsen*. This was the first occasion that I ever saw a London and North Western passenger engine in Bradford (Lancashire and Yorkshire) station, though the goods engines had run there for many years. Great Western engine No. 383 ('Sir Daniel' class) mentioned by Mr. Robson differed from the rest of the Swindon rebuilds in having a Wolverhampton three-ringed boiler put on. The boiler was sent from Wolverhampton to Swindon and put on at the end of 1886."

Destination and Route Indicators.

Referring to the article on this subject published last month, Mr. G. Oxley points out that while it is generally correct that "A feature of London and South Western head-code practice is that empties and engines going up to Waterloo carry the head-code which the trains will bear on departure," and is entirely so in regard to light engines, it does not always apply for long-distance empties. Many of these come from Clapham Yard, and have a distinctive head-code in the form of a round disc in position 1, and a diamond in position 4 (as per diagram on page 231). A number of empty trains also start from Durnsford Road Sidings (Wimbledon Park), these mostly for local trains, and they bear round discs in positions 2 and 4, though Mr. Oxley mentions that he has seen the old 7.56 a.m. (now replaced by the 7.58) and the late 7.37 a.m. (now 7.25) from Earlsfield to Waterloo (workman's) bearing these discs when carrying passengers, though they usually have the Leatherhead Line headlights.

Old 2-4-0 Express Engine, No. 56, Victorian State Railways.

Mr. H. Cherry, an Australian reader, sends particulars, with a photograph, which will not, however, reproduce satisfactorily, of this old engine. This was one of an order of 25 delivered to the Victorian State Railways in 1861 and 1862, by Messrs. Beyer, Peacock & Co., of Manchester. These engines were known as the "B" class, and were given the even numbers between 50 and 98. They were all in service for about 45 years and then gradually disappeared, No. 98 being the second last to go in 1912, after doing 50 years' honourable service. No. 56 is, however, still running. This was the crack engine of the batch, and ran the Victorian portion of the Sydney express for nearly 20 years. It was the most powerful of them all, which probably accounts for its long career on the Sydney express. As has been mentioned in these columns, there are many heavy banks in Victoria, and the way this engine used to take them surprised most people who watched her performances. This engine climbed a three-and-a-half mile bank of 1 in 50 in 14 min. starting from rest with a train of 125 tons, and has been known to travel nearly 82 miles an hour down the same incline. The average consumption of coal was 24 to 28 lbs. per mile. The cylinders of No. 56 were 17½ in. dia. by 24 in. stroke; the leading wheels 3 ft. 6 in. dia. and the coupled wheels 6 ft. The wheelbase from leading to driving was 8 ft. 3 in., and from driving to trailing 8 ft. 6 in. The boiler had a heating surface of 1,015 sq. ft., of which 168 tubes of 2 in. dia. supplied 921 sq. ft. The grate area was 15½ sq. ft., and the working pressure of steam 150 lbs. The tender ran on 6 wheels, 3 ft. 6 in. dia., spread over a wheelbase of 10 ft. 6 in. The tank carried 2,000 gallons of water, and the bunker 3½ tons of coal. The weight of engine and tender roadworthy was 55 tons.

The leading features were all of Mr. Beyer's designs: the raised firebox with the two Ramsbottom safety valves on top, the polished brass whistle, and the copper top to the chimney.

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The engine was painted a bright green with white bands and lining, and looked very well, although it must be admitted it appeared rather cumbersome with the double frames. Reversing was effected by link motion of the Stephenson type, worked by a lever from the right-hand side of the cab.

No 56 has probably completed two million miles in the 55 years it has been in service, and it was the first engine in Victoria to be fitted with the Westinghouse brake. It is now used as yard engine at North Melbourne, and amongst other functions it is employed to wash out the boilers of the locomotives that come into the North Melbourne yard for that purpose, and also to supply their boilers with warm water when the washing out process is completed.

Railways in South-West Africa.

A FEATURE of a report issued by the South African Railways and Harbours Board is the authoritative statement it contains relative to the railways in the South-West Africa Protectorate, as follows:—

(*a*) At the time of conquest and occupation:—

	Miles.
(1) The Otavi Railway, extending from Swakopmund to Tsumeb, with branches from Onguati to Karibib, and Otavi to Grootfontein, 2 ft. guage	421
(2) The State (Northern) Railways, extending from Swakopmund, *viâ* Jakal water to Karibib and Windhuk, 121 miles narrow gauge, 119 miles 3 ft. 6 in. gauge, total	240
(3) The North and South Railway, extending from Windhuk to Keetmanshoop, 3 ft. 6 in. gauge	317
(4) The Southern Railways, extending from Luderitzbucht to Keetmanshoop, with a branch line from Seeheim to Kalkfontein, 3 ft. 6 in. gauge	340½
Total mileage	1,318½

The foregoing do not include the following privately owned lines:

	Miles.
Kolmanskop to Bogenfels *viâ* Pomona (narrow gauge)	99½
Rehoboth Station to Rehoboth Town (narrow gauge)	3
Arandis station on Otavi line to Khan Mine (narrow gauge), approximately..	12
Karibib to Marble Quarries (narrow gauge), approximately	15

(*b*) Constructed for Military purposes during the war:

	Miles.
(1) From Walvis to Swakopmund, 3 ft. 6 in. gauge	23
(2) Conversion of line from narrow gauge to 3 ft. 6 in. gauge, Swakopmund to Usakos	100
(3) Avoiding line from Usakos to Karibib, 3 ft. 6 in. gauge	20
(4) Upington (South) to Kalkfontein, 3 ft. 6 in. gauge	172
	314½

On the instructions of the Government the Railway Administration took over these railways as forming part of the railway system as from August 1st, 1915, subject to the Military Authority still obtaining in the South-West Protectorate, leaving for future settlement the question of the amount, if any, to be added to the Railway Capital Account. The Commissioners express the opinion that these railways, for some years at least, will prove unremunerative without taking into account interest on capital, and consider that the lines should be worked for, on behalf of and at the cost of the Defence Department, until a complete settlement is come to as to the terms upon which they are to be incorporated in the South African Railway system.

Drivers and Their Ways.

REFERRING to a paragraph under this heading in the August RAILWAY MAGAZINE based upon remarks contributed by Mr. Malcolm Niven, Mr. W. H. Robson, of Cardiff, sets forth alternative views on this vexed question. He writes: "I question whether all his (Mr. Niven's) recommendations regarding the handling of an engine are the best in actual practice. There is no doubt but that 'linking' up is often overdone; and throttled or air-drawn steam is superior to the ordinary saturated steam during the periods of expansion, exhaust and compression, owing to the drier condition of the former. 'Linking up' brings about a contracted exhaust area and excessive compression, the latter creating heavy 'wear and tear' of the running parts. Within certain limits, running with the regulator partly closed, and the gear sufficiently forward, is as economical in steam consumption as running with the regulator full open and 'linking up' to suit; the engine, in the former state, running more freely. That remark about 'the engine using a greater volume of steam in the cylinders with the gear well forward and the regulator half open,' is somewhat misleading. Of course, in this case, it takes a larger volume of steam to supply the cylinders, but it must not be overlooked that in throtling the steam its volume is increased and, of course, pressure reduced, between the boiler and the cylinders, as the volume of the steam actually leaving the boiler for each stroke of the engine will probably not be any greater—if as great—than in the case of the earlier 'cut off' and regulator full open."

"My brother, who is a driver on the Great Western Railway, has informed me that he does not work his gear further back than to cut off at about 30 to 35 per cent., manipulating the regulator to suit. He finds the engine run and ride better, also are more economical, when handled in this manner, more especially the 'County' class. I have a few particulars of results obtained by him for the half-year ending December, 1912, when driving engine No. 4307 on express goods train between Bristol and Wolverhampton, and between Bristol and Carmarthen. Two engines, Nos. 4307 and 4308, of the 2-6-0 type, were engaged on these trains,

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and the driver of No. 4308 was doing better than the man on No. 4307, so the latter was superseded by my brother, who drove that engine for 14,937 miles on a coal consumption of 36 lbs. per mile; his predecessor covered 3,664 miles on a consumption of 39·8 lbs. per mile, while the man on No. 4308 drove his engine 22,125 miles on a consumption of 37·3 lbs. per mile. The average load of these trains was 55 wagons, and the above was done without losing any time, no report having been received during the whole period. The other two men used to work with the gear back, as far as possible, with the result that No. 4308 got into a rough state in a short time, whereas the 'wear and tear' of No. 4307 was almost inappreciable, after having been out of the shops nearly two years, the economy in coal and oil consumption having been maintained up to the last. I need hardly say every effort was made, and care taken, by the enginemen to get the best out of their engines, and I think the results speak well for the engines."

The Railway Club.

At the Railway Club, Westminster, the reading of a paper by Mr. C. J. Allen is always regarded as an event of first-class importance. His subject at the December monthly general meeting was "Miniature Gauge Railways," and there was a goodly gathering of members in attendance, who listened with keen interest to Mr. Allen's remarkable collection of facts, figures and theories concerning his subject. The annual general meeting will be held at the Club premises, 92, Victoria Street, S.W., for the election of officers, etc., for 1917, at 7 p.m., January 9th, after which Mr. Basil Mercer Bazley will contribute a paper entitled "The Cheshire Lines Committee." Railway Magazine readers are reminded that whether in railway service or not all are eligible for membership of the Club, and that special low terms are arranged for country members. Application for membership should be made to the Hon. Sec., Mr. E. J. Miller.

WOMEN WORKERS AT THE SHOPS OF THE WESTINGHOUSE BRAKE CO., LTD.

BEFORE THE WAR WOMEN WERE NOT EMPLOYED IN THESE WORKS.

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WHAT THE RAILWAYS ARE DOING

On November 18th, at the Portman Rooms, Baker Street, W., a concert, organised by the Great Central Railway ambulance classes, was held. Mr. J. Rostern, Chief Goods Manager, Great Central Railway, occupied the chair. The concert was contributed almost exclusively by members of the Great Central Railway staff, but execution was quite up to ordinary professional standards. Proceeds were devoted to the St. John Ambulance Association's fund to provide stretchers and ambulances for troops at the Front. It was intended that they should also cover the cost of a stretcher for the use of the ambulance classes, but through the kindness of Mr. W. Clow, Superintendent of the Line, this has been provided for otherwise. During the proceedings Mr. Rostern referred to the work of the ambulance classes, and presented the awards earned by students. Out of a total of forty-two members who underwent examination in connection with these two classes, thirty-four succeeded in passing for awards, as follows: First year (certificate), twenty-five; second year (voucher), two; third year (silver medallion), four; fourth or subsequent year (silver label), three. The ambulance movement has been fostered on the Great Central Railway for many years, and since the early part of 1914, the Company have had its own centre for the St. John Ambulance Association. During the twelve months ended September 30th last, twenty-five examinations have been arranged through this centre, the number of Great Central Railway employés examined being 456. Out of this number 227 gained the certificate and 110 were examined for the fourth time at least.

* * *

For many years the issue of packets of tickets for each day of the week, sold at a reduction upon the sum of the fares represented, has been a very important factor in the Great Eastern Railway suburban area, and several hundreds of thousands of tickets are issued on this basis every twelve months. In order to conserve the expenditure on tickets, and following experimental introduction at Hoe Street, Walthamstow, and Maryland Point stations, two of the busiest in this respect, the issue of these packets has been discontinued in regard to Leytonstone, Manor Park, Bruce Grove and Noel Park and Wood Green, and instead single tickets are issued for the week. These are of ordinary size and style, but each of the longer edges is printed in divisions for the six days of the week. The bottom edge is clipped on the outward journey and the top edge on return, in each case for the day concerned. To assist the collectors, the tickets are overprinted with three blue stripes across, so that each alternate day is covered by the blue.

* * *

First published in 1899 under the title of "Illustrated Guide and List of Hotels," the London and South Western Railway Official Guide "Hints for Holidays" will in future be entirely controlled by the Company. Mr. F. V. Milton, Chief of the General Manager's Publicity Department, has been appointed Editor and Manager in succession to Mr. W. T. Perkins. Local representatives remain as hitherto: Mr. G. F. Vallance (Exeter), Western District; Mr. J. Townsend (Ringwood), Southern District; Mr. Phillips, Isle of Wight; and Mr. S. Madge, Salisbury District.

* * *

We regret to learn that Mr. Peter Campbell, Accountant, Glasgow and South Western Railway, died suddenly in a tramway car on his way home on the evening of November 22nd. Mr. Campbell, who was fifty-six years of age, had been forty years in the service of the Glasgow and South Western Railway, and had acted as Accountant during the last twenty-one years. The funeral was private, and the mourners included, amongst others, Mr. Cooper (General Manager), Mr. Gillies (Secretary), Mr. Cockburn (Superintendent of the Line), Mr. Robinson (Goods Manager), Mr. Vallance (Audit Accountant), and Mr. Russell (Telegraph Superintendent).

* * *

As another war-time arrangement, the Railway Executive Committee gave notice that the arrangements for the collection and delivery of passengers' luggage in advance and for the delivery of luggage under the "carted luggage" arrangements would be suspended by all companies as from Monday, December 11th, 1916. For some time only certain railways have continued to perform these services, and now all will come into line.

* * *

Following a suggestion placed before the London and North Western Railway by the Dudley Chamber of Commerce, who, failing the reinstatement of a breakfast-car on the morning train to London and a dining-car on the return train in the evening, asked that something more satisfactory than the usual luncheon baskets might be served on the trains to London, has

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resulted in the introduction of cardboard boxes containing suitable cold viands. Arrangements have been made for light breakfasts, luncheons, and dinners to be thus served at Euston and New Street (Birmingham) stations respectively.

* * *

MR. H. E. HORNE, who has been appointed assistant to the Superintendent of Passenger Service, Midland Railway, commenced his railway career as junior clerk at Armley in December, 1888, and remained at that station until April, 1894. He was then transferred to Newlay, and afterwards to Newark, as clerk. Mr. Horne removed to Derby as relief clerk in May, 1896, and was appointed stationmaster at Harpenden in October, 1899. He occupied a similar position at Cheltenham from February, 1907, until December, 1909, when he was transferred to Leeds as stationmaster.

* * *

ON Tuesday, December 5th, employés of the Metropolitan District Railway entertained wounded soldiers from neighbouring hospitals at the "Albert Stanley" Institute, adjoining Hammersmith (Broadway) station. Funds had been entirely raised by the sale of tickets among the staff and friends, from two Cinderella dances recently held and in other ways. Guests were brought from the hospitals in charabancs provided by the London General Omnibus Company. They arrived about 3 p.m., and before and after tea were made free of the billiard and games rooms in the Institute, smoking requisites being provided. After clearing away the tables, the hall was rearranged for a very complete entertainment. Lieut. F. T. Chapman occupied the chair. The artistes included Miss Annie Anstiss, Miss Violette Stanning, Miss Lily Foden, Miss Tilley, Miss Hilda Coote, Madame Bessie Kendall, Doris and Queenie Prosser and Iris Ladore in songs and dances, and Messrs. Charles Brookman, Will Kay, Barclay Brown, Lionel King, G. Garrad, jun., "Kay and Mac," G. Braley, and G. Clarke. Mr. C. J. Cashman, as Hon. Secretary, and Mr. W. S. Every, as Chairman, represented the Entertainments Committee, Messrs. C. Thurston (Hon. Secretary) and H. G. Jeffs (Chairman) the Catering Committee, and Messrs. W. Hilton (Hon. Secretary) and A. J. Dalley (Chairman) the Games Committee. Miss Annie Anstiss acted as accompanist, while Messrs. Clarke and Garrad were stage managers. The Institute orchestra (Conductor, Mr. J. Ryman) also assisted. Considerably over 100 soldiers were present, who in pre-war days were engaged on the main line companies and the Underground, although one member of the party hailed from Canada, where he was in the service of the Canadian Pacific Railway. Lieut. Fred Chapman, who himself has been severely wounded, and is now the military representative of the Hounslow Tribunal, presided over the gathering, and among the officials of the Underground who looked in during the afternoon and evening were Messrs. H. E. Blain (Operating Manager), W. E. Blake (Superintendent of the Line), S. J. Webb (Passenger Agent), J. B. L. Lindsay (Assistant Secretary), A. R. Cooper (Engineer), P. G. McMahon (Superintendent of Power), and J. Millan (Assistant Superintendent of Power).

* * *

LAST month we referred to the War Seals movement as taken up by the London and North Western Railway. The Great Eastern Railway has now followed in the same direction. These adhesive seals can be used on envelopes sent through the post, the object being to raise sufficient money to erect flats for letting to disabled soldiers and sailors at a nominal rent. Members of the staff and public wishing to further this good object, with direct application to Great Eastern men who may be disabled in the war, should purchase seals from the local stationmaster or goods agent. The seals, which are issued in books of twenty-four (price 1s.) are also on sale at the Chief Traffic Manager's Publicity Office, Liverpool Street station.

* * *

A COPY of "The 'Met.' Accountants' Gazette" is to hand. This little brochure is issued by the staff of the Accountants' Department, Metropolitan Railway, and with other items of interest takes account of the members of the staff now serving with the forces. Special sections are those devoted to the War Service Corps, while "Gleanings from other offices" shows that the accountancy staff follow the work of other departments. Finally, there is a Roll of Honour —something about the men of the department now on active service.

* * *

THE Highlands of Scotland—the district served by the Highland Railway—is very largely a tourist country. The climate being salubrious and the air bracing, large numbers of holiday makers frequent such well known resorts as Pitlochry, Kingussie, Aviemore, Grantown-on-Spey, Forres, Nairn, Inverness, Strathpeffer Spa, Golspie, Brora, and Dornoch. The district is sparsely populated, and the Highland line consists almost entirely of single track. On the journey from Perth to Inverness the line rises to a height of 1,484 ft. above sea level, this being the greatest altitude reached by any railway in Britain.

* * *

ALTHOUGH Mr. Percy Syder has only for a year and a half represented the commercial interests of the Great Eastern Railway in the Ipswich district, he has already made his mark in the town of his adoption, with the result that he is now a member of the Ipswich Town Council. Mr. Syder is the happy possessor of a winning personality coupled with considerable business capacity, and Ipswich people have not been slow in appreciating his capabilities. In November, under Mr. Syder's presidency, a Great Eastern Railway War Savings' Association was formed at Ipswich, and is reported to be already an assured success.

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NOTHING if not public-spirited are the powers that be on the London and North Western Railway. The "eat less meat campaign" had for war-time reasons scarcely been launched before travellers on the premier railway were provided with the opportunity of enjoying at the railway's Euston Hotel daintily served and most appetising vegetarian fare. The half-crown *table* d'hote on a recent date was a model of the kind. For the soup course there was a choice of marmite or tomato. Then came poached eggs with spinach or macaroni cutlets, the accompanying vegetables being potatoes and cabbage. Sweets followed the choice, being apple tart or prunes and rice. At Euston station dining room, on another recent date, the menu of the 2s. table d'hote was equally attractive and satisfying. There, too, was provided a cheese luncheon consisting of cheese, bread, butter and salad, nicely served in pleasant and comfortable surroundings at the low charge of one shilling.

* * *

To supplement a successful six weeks' autumn campaign and tour of the Great Eastern Railway egg and poultry demonstration train, a very pleasing and useful function was held at the Cambridge Room, Liverpool Street station hotel. Representatives of the Board of Agriculture, educational authorities, agricultural associations and others were present. Mr. H. W. Thornton, the General Manager, on behalf of the Great Eastern Railway, extended a cordial welcome to all and warmly thanked those who had assisted in the work, including those members of the railway staff who had ungrudgingly given their time and services. In these days, said he, when the production of all sorts of food was so important that we were soon to have food control in some form or other, we should do everything possible to increase the production of all sorts of edibles in this country. After all, modern warfare meant that all the efforts of the nation should be mobilised. There was no doubt that this country could produce very much more food than it had done in the past, and the effort now being made by the Great Eastern Railway was a contribution towards solving the problem. Mr. William C. May, Chief Traffic Manager, said that similar egg-demonstration trains had been run in other parts of the country, but their work had not gone much further. The Great Eastern, however, were not going to stop there, and it was their intention to keep the business going so as to increase the production of eggs and poultry in East Anglia. Mr. E. Brown had done some fine work in the course of the tour, and his lectures had been much appreciated. He was also very grateful to Mr. Leigh and to Mr. Duncan Anderson, the forester to the company, who had given extremely interesting lectures to the children. One result of this tour had been to bring the various agricultural societies together, and he was sure that if they all worked together they would be able to increase the egg and poultry business to the great benefit of all. Mr. T. W. Watts, Commercial Superintendent, called attention to the importance of the fact that so many of the visitors to the train had been children. What the company were doing would benefit not themselves alone, but would help the people as a whole to increase the production of food. They must all organise, and he hoped that all present would act as missionaries in furthering the ideas put forward in the course of the tour. The company had long ago offered to provide at their stations storage facilities for the reception and distribution of eggs and poultry. In the town of Ipswich there was a store for eggs, but it involved their being carted to and from the station. If the store were at the station all this expense of cartage for eggs arriving or to be despatched by train would be saved. Concerning the train, it may be stated that some 36 centres were visited in Suffolk, Cambridgeshire, Norfolk and Essex, beginning with Mildenhall on October 9th, and ending with Bishop's Stortford on November 18th, and the total number of visitors to the train was 45,796, consisting of 33,621 adults, 6,763 children from schools and 5,412 other children. Much interest was shown in each district. The train was in charge of Mr. R. A. Newman, the Chief Traffic Manager's representative, with whom was the lecturer, Mr. E. Brown, F.L.S., and four demonstrators:—Mr. S. C. C. Avis (model car), Mr. J. N. Leigh (hatching and rearing car), Mr. C. E. Wallace (egg and poultry car), and Miss B. Trudgett (egg-testing car). The following also assisted:—Miss L. Guymer (Eastern Counties Farmers' Co-operative Association), Mr. E. G. Warren (Framlingham and District Agricultural Co-operative Society), and Mr. D. Anderson (Great Eastern Railway).

* * *

A LARGE and very representative gathering of delegates from local authorities, public bodies and private firms accepted an invitation sent out by Mr. H. E. Blain, of the London "Underground" and associated systems, to attend a conference at Caxton Hall, with a view to the general application and the development in Greater London of the "Safety First" movement so successfully initiated by the London General Omnibus Company, of which Mr. Blain is operating manager. Among those connected with railways who were present were Mr. Murray Griffiths (Director, Metropolitan District Railway), Mr. W. E. Mandelick (Secretary and Business Manager, London Electric Railways), Mr. J. Pepper (London Outdoor Goods Manager, Midland Railway), Mr. F. V. Milton (Publicity Manager, London and South Western Railway), Mr. J. Wardle (Commercial Manager, Metropolitan Railway), Mr. W. Holt (Traffic Superintendent Metropolitan Railway) and Mr. F. Saward (London Cartage Manager, Great Northern, Great Eastern and Great Central Railways). From the chair, Mr. Blain explained the circumstances under which the conference had been convened, and said the companies who had taken action carried 971,000,000 of passengers per annum, and so were deeply concerned in anything which affected street safety. The campaign had had the result that they had

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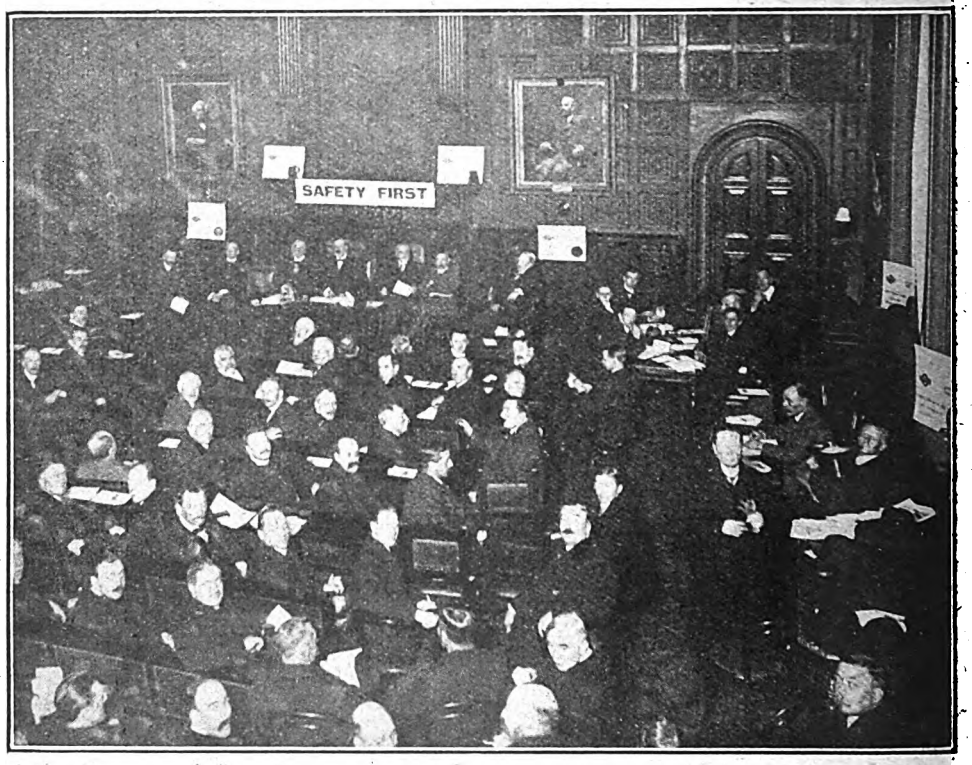
succeeded in reducing the number of accidents by 25 per cent. this year as compared with last year, and it was their genuine opinion that very much more might be done for the protection of the public and the safety of the streets. Indicating the direction in which action might be taken, Mr. Blain said that they might have courses of instruction for traffic and transport employés, and in some central place exhibit films showing the danger of the streets and the importance of observing the rules of the road. Some of the metropolitan boroughs had done a great deal in providing refuges in the centre of the street, but a common survey in regard to this matter by experts would be of distinct usefulness. Then there were people who believed that a scientific consideration of the problem of street lighting might do something to improve the conditions prevailing. An educational and publicity committee would assist in bringing these problems home to the public, to school children, and to all ordinary users of the highways. In this connection there might be supplied free to cinema theatres films showing street dangers, thereby bringing them graphically to the minds of the public and the children in a way which talking failed to achieve. Among the subsequent speakers were Sir George Welby (Mayor of Westminster), Mr. Joynson Hicks, M.P., and Mr. Gordon Selfridge. Resolutions were passed recommending the appointment of a London "Safety First" Council, with delegates from all the bodies represented.

* * *

At the third meeting of the winter session of the Institution of Locomotive Engineers, held on Saturday, December 9th, at Caxton Hall, Westminster, a paper was read and discussed on "Locomotive Fireboxes," contributed by Mr. Smith Mannering, Chief Boiler Inspector, London, Brighton and South Coast Railway.

* * *

Mr. Donald A. Matheson, General Manager, Caledonian Railway, has, as Chairman of the General Managers' Conference of the Railway Clearing House, accepted the Chairmanship of the Board of Management of the Railway Benevolent Institution for the year 1917, in succession to Mr. Frank Potter, General Manager, Great Western Railway.



Photo] [*Topical.*

"SAFETY FIRST" CONFERENCE AT CAXTON HALL, WESTMINSTER.

* * *

Midland Railway steamers on the service between Heysham and Belfast have been requisitioned by the Government, and until further arrangements are made no traffic can be conveyed by that route to Belfast or to interior stations in Ireland *viâ* Belfast.

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FROM our Great Western Railway contemporary we glean that to the list of notable men whose early days were spent on the Great Western Railway, must be added that of Sir William Henry Dunn, the present Lord Mayor of London, who was, from October, 1869, to April, 1878, a member of the Company's staff in the Audit Office at Paddington.

* * *

THE Board of Trade has issued an order extending for one year, from August 16th, 1917, the time limit for the construction of the Axholme Point Railway (Hatfield Moor Extension Light Railway), Lincolnshire, and for a light railway in the parish of Hatfield, Rural District of Thorne, and the parishes of Armthorpe and Cantley, Rural District of Doncaster.

* * *

MR. K. PATON, writes in regard to South Eastern and Chatham Railway Stirling engines already mentioned as being still unrebuilt, that Nos. 206 and 209 now have extended smoke-boxes and other changes. No. 208 has been rebuilt similarly to No. 209. He also mentions that the large superheater 4–4–0 engines are now shedded as follows: Cannon Street (3)—Nos. 763, 764, 765, 77, 773 and 775; Tonbridge (5)—Nos. 769 and 770; Hastings (12)—Nos. 768, 774, 779, 780; and Ramsgate (13)—No. 776.

* * *

MR. MALCOLM M. NIVEN writes in reference to the new 4–4–0 engines on the Caledonian Railway: "I note that Mr. Littlejohn mentions No. 124 being now No. 1124. This engine was named *Eglinton*, after Lord Eglinton, and used to run to Ardrossan. It was, in fact, stationed there for some time. No. 124 was one of the Drummond bogies built by Dübs & Co., and was exhibited when new at the Edinburgh Exhibition. No. 79, *Carbrook*, built at St. Rollox, was a similar engine. No. 116, also referred to, was a favourite engine on the Gourock road until replaced by the 4–6–0 engines, *Sir James King* and *Barochan*. Driver Duncan Macmillan drove No. 116 for many years. Latterly he drove No. 911, *Barochan*, but he has now joined the majority. The Drummond 'wee bogies' Nos. 81, 82, 85, 86 and 116 were all at Gourock. I remember, however, among engines on the trains in the early '90's, the outside cylinder rebuilds, Nos. 473, 479, 380."

* * *

ANENT Mr. Niven's remarks as to the withdrawal of Stirling 2–4–0 engine No. 71A, Glasgow and South Western Railway, "Dalry Reader" mentions that he recently saw No. 62A, of the same class, at Dumfries, so that apparently the class has not yet entirely disappeared.

* * *

LONDON and South Western Railway large 4–6–0 engine No. 460 and 4–4–0 engines Nos. 466, 468, 469 and 470 have been fitted with "Eastleigh" superheaters and extended smoke-boxes.

* * *

MR. JAMES VALLANCE, Audit Accountant, Glasgow and South Western Railway, has been appointed Chief Accountant in succession to the late Mr. Peter Campbell. Mr. Vallance will also continue to discharge the duties of Audit Accountant.

* * *

MR. W. N. BANCROFT, Secretary, Midland Railway, has been elected a member of the Council of the Chartered Institute of Secretaries, in place of Capt. Douglas Brodie, secretary of the British South Africa Company, who was killed in action last August.

* * *

MR. STANLEY BALDWIN, M.P., has been appointed a Director of the Port Talbot Railway and Docks in place of Lord Dunraven, resigned.

* * *

MR. W. J. SAWKINS has been appointed Secretary and Accountant of the Sheffield District Railway, *vice* Mr. C. R. Davies, retired.

* * *

THE Queensland Government Railways have not been backward in sending men to serve with His Majesty's Forces. The Chief Commissioner reports that the number who had enlisted to June 30th last was 1,596—267 salaried employés and 1,329 wages employés. Of these, fifty-one have given their lives, while eighty-eight have been wounded. As a large proportion of those who have volunteered for service received from the department considerably more pay than that given them by the Military, and as this difference is not made up to them by the Government, as is done in New South Wales, it was necessary, in order to assist their dependents, to establish a Railway Patriotic Fund, which is entirely supported by voluntary subscriptions from the rest of the staff. This fund has up to the present been able to make up, as nearly as possible, the difference in the rates of pay, in those cases where it has been shown that need existed.

* * *

AN Indian correspondent reports that the Great Indian Peninsula Railway has recently constructed at the Matunga Works a saloon carriage for His Highness the Rana of Dholpur. The car is built to the maximum dimensions at present allowed on the broad gauge, and is 68 ft. long by 10 ft. wide. Externally it is finished in cream enamel with blue and gold lining. A novelty in the external finish is the illuminated "Coats-of-Arms" at the sides which can be electrically lighted at night; by day, the armorial bearings are carried on shields. The body is built on a steel underframe carried on two bogie trucks, each of which has six rolled-steel disc wheels, while all the details of equipment required by the different railways over which it may run are also provided. The central portion forms a drawing-room, and at one end is a bedroom, with bath-room adjacent. At the other end is a dining-room, with servants' quarters and kitchen.

* * *

CANADIAN Pacific Railway Divisions will in future be known as districts, and have been renamed as follows: Atlantic Division—New Brunswick District; Eastern Division—Quebec District; Ontario Division—Ontario District;

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Lake Superior Division—Algoma District; Manitoba Division—Manitoba District; Saskatchewan Division—Saskatchewan District; Alberta Division—Alberta District; British Columbia Division—British Columbia District. The former districts are now called divisions, as, for example, District No. 2 of the old Eastern Division is now the Montreal Terminal Division, and District No. 3 of the old Alberta Division is now the Calgary Division.

* * *

MR. G. W. PILKINGTON has been appointed Secretary of the South African Railways and Harbours Board, *vice* Mr. T. M. Berrange, transferred, in addition to his present appointment as Private Secretary to the Minister of Railways and Harbours.

* * *

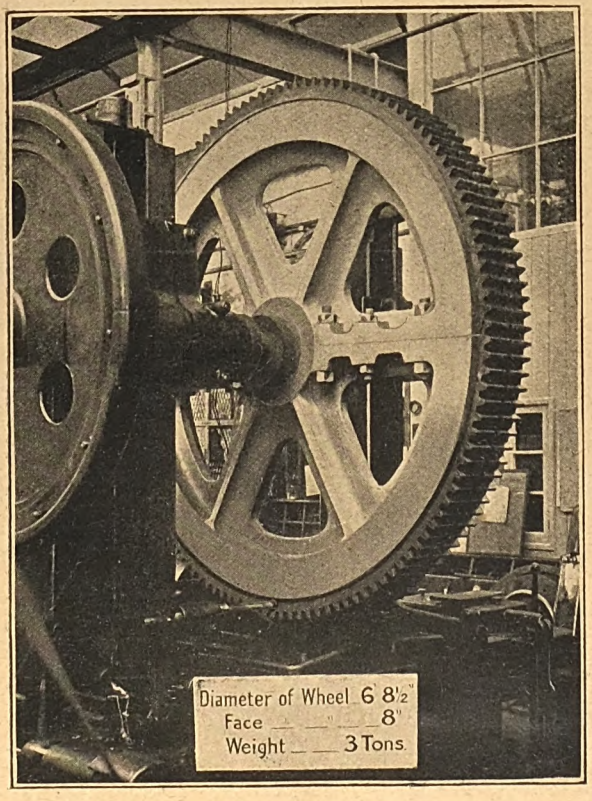
A RAILWAY company for service in France has been formed from the staff of the South African Railways. This consists of three officers and 266 men. Of these, 144 are volunteers from the transportation traffic staff, 115 from the transportation running staff, and 7 from the running shed staff.

* * *

THIRTY-ONE years ago, on November 7th, the golden spike was driven which marked the completion as a through main line of the Canadian Pacific Railway. The occasion was recalled at Vancouver, where live some of the survivors of that memorable gathering in the lonely recesses of the Eagle Pass. Donald Smith, who drove the spike, uttering the word "Craigellachie," is no more, but his colleague, Lord Mount Stephen, is still with us. Mr. F. W. Peters, the General Superintendent of the British Columbia division, is at his post of duty. Mr. Richard Marpole discharges the duties of general executive assistant for British Columbia. There also remains Mr. H. J. Cambie, consulting engineer for the division.

* * *

THE Secretary of State of Canada has expressed to the Grand Trunk Railway of Canada his appreciation of the excellent manner in which the special train, carrying the Governor-General, was operated between Montreal and Ottawa, on the occasion of his Excellency's arrival in Canada. The Duke of Devonshire used the Grand Trunk Lines on his first official railway journey in the Dominion. Mr. Thomas Mulvey, Under-Secretary of State, in a letter to the Grand Trunk, says:—"I have been instructed by the Secretary of State to thank you for the fine manner in which the Governor-General's train was handled at St. Henri and on to Ottawa. Every possible attention was given and nothing had been overlooked. It is very satisfactory to the Secretary of State and to everyone concerned, that the first trip of his Excellency should be taken under such favourable conditions."



A NOTABLE WORKSHOP UNDERTAKING.

The illustration shows a large gear wheel in process of being cut at the Morse chain shop of the Westinghouse Brake Co., Ltd., 82, York Road, King's Cross, London. This wheel forms part of an 80 H.P. Westinghouse-Morse Rocker Joint chain drive, to air compressor, destined for the St. John del Rey Mines, Brazil.

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4—4—0 LOCOMOTIVE No. 73, "SNAIGOW": HIGHLAND RAILWAY.

Mr. C. Cumming, Locomotive, Carriage and Wagon Superintendent.

Fitted with Robinson superheater, Walschaert valve gear, and Belpaire firebox.

Cylinders: 20 in. by 26 in. Coupled wheels: 6 ft. 3 in. diam. Bogie wheels: 3 ft. 3 in. diam. Steam pressure: 160 lbs. per sq. in. Total weight, engine and tender, in working order: 98 tons 2 cwt. Wheelbase, engine and tender: 46 ft. 5½ in. Total length over buffers: 55 ft. 7 in.

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AN EARLY NARROW GAUGE THIRD CLASS COACH.

Great Western Railway Rolling Stock: Past and Present.

By DENIS O'DONOGHUE.

ACTIVITY during the decade closing with the outbreak of war was very noticeable in the Carriage and Wagon Department of the Great Western Railway, and the history of that Company's developments in rolling stock design and construction provides an admirable epitome of the general movement in the search for the most fitting and satisfactory type of vehicle adapted to modern requirements.

The original stock for the broad-gauge line was supplied by several private contractors, and outside firms continued to provide the Great Western Railway with rolling stock until about 1867, in which year the Company built carriages and goods vehicles at the Worcester shops, taken over from the West Midland Company. Swindon Carriage Works were opened in 1869, and the first coaches built there were six-wheel third-class and composite vehicles, turned out in 1871. These vehicles were 28 ft. long, the length being increased by 3 ft. in those next constructed.

A big change in the design of passenger rolling stock from the early type of railway coach to the modern large carriage was effected by the introduction of bogie vehicles, and the first bogie fitted carriage for the Great Western Railway was built at Swindon Works in 1874; this eight-wheel carriage was 46 ft. long and had a "pigeon" roof. Four-wheel coaches are now confined to local services, and the same may be said in a large measure of the six-wheel carriage. For express train working bogie cars are the rule on the Great Western Railway, although, due to some special circumstance, a six-wheel carriage may be occasionally attached to an express train. The bogie coach practically monopolises the stock for express train working, and is largely used for the heavy suburban traffics. The broad gauge was finally abolished on May 21st and 22nd, 1892, and in readiness for the change locomotives, carriages and wagons had been built that were convertible; in 1881 carriages were constructed with narrow-gauge bodies on broad-gauge frames.

Pictures of the earliest railway carriages show the third-class carriage as an uncovered vehicle, and these were succeeded by carriages roofed but open at the sides, although the first-class carriages were covered. Some of the early coaches were built with iron bodies, and in others wood and papier maché were used. An interesting

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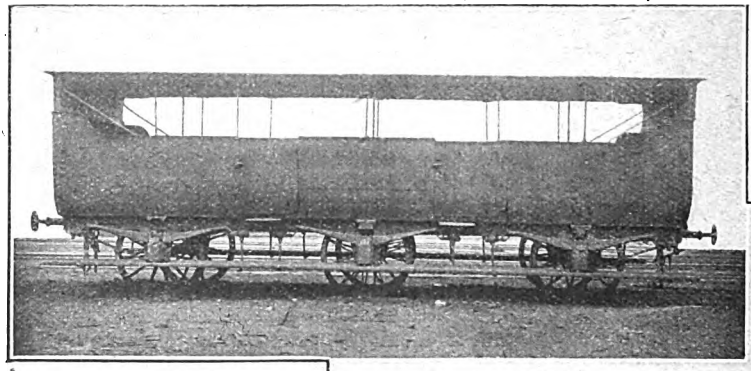
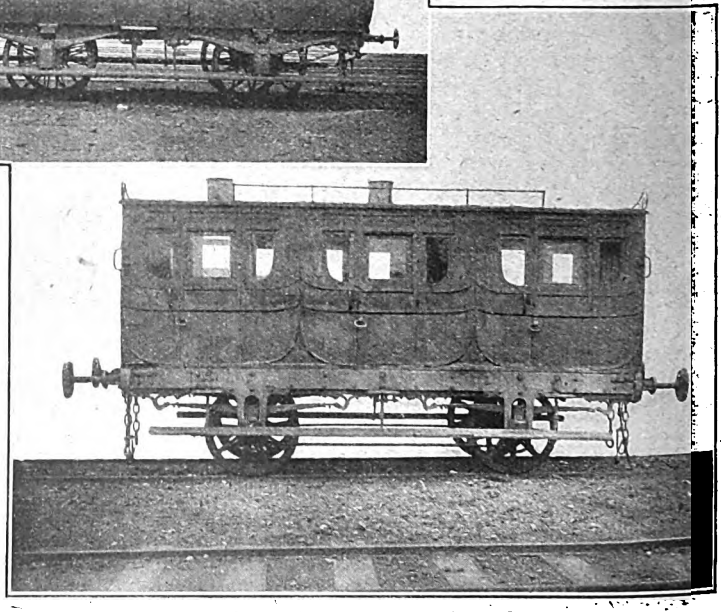
comparison between the old and the new carriages is found in the seating capacity. In the early narrow-gauge third-class coach illustrated, it will be noticed that only two compartments, one over each pair of wheels, are contained in the vehicle, while for illumination one lamp fixed in the roof served to supply all the light for both sections.

In 1890 the first Great Western corridor train was constructed, the carriages for which were 50 ft. long. They had bay windows and clerestory roofs, the third-class



NARROW GAUGE IRON BODY THIRD CLASS CARRIAGE.
Built about 1846.



NARROW GAUGE FIRST CLASS CARRIAGE, WITH WOODEN FRAMES AND PAPIER MACHE PANELS.
Built by Wright Brothers in 1846.

coaches seating 64 passengers in eight compartments. The train was first put into working in the London, Birmingham and Birkenhead service. Three years later another important event occurred when restaurant cars, first class only, were introduced, and in 1900 the first buffet train was built, followed by another the next year. These trains were electrically lighted. In 1901 the first saloon carriage to be carried on bogies was constructed at Swindon Works. A period of experiment and reform in carriage design and equipment dates from the time the construction of the first buffet train was projected. Carriages with lavatory accommodation were running before 1890, but these, while they constituted a stage in the transition from closed compartments to corridor cars, and went some way towards furnishing the conveniences of modern travel by railway, did not enable a corridor train to be formed; they were self-contained and without the means of access to adjacent coaches.

Lavatory accommodation was first provided in a number of family saloons, and in 1882 was introduced in ordinary vehicles, in which year ten first-class carriages were so fitted; seven years later lavatories for first-class coaches became more general.

About this time 58 ft. vehicles were introduced, and in 1902 third class cars 68 ft. long were put into traffic, a number of third-class non-corridor vehicles of this length seating 100 passengers in ten compartments. In 1905 coaches of the extreme length of 70 ft. were constructed and corridor third-class carriages of this length with a tare of 33–34 tons were built with ten compartments, seating 80 passengers. When adopting the principle of the ultra-long carriage, a variation was also

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made in the width, the standard of 8 ft. 6 in. giving way to 9 ft. 6 in., modified in later lots to 9 ft. 3 in. and 9 ft. Coaches 9 ft. 6 in. wide were first built for the "Cornish Riviera Limited" trains. These vehicles, 69 ft. long with a wheelbase of 63 ft. and a tare of over 32 tons, were modelled somewhat on the lines of the cars familiar in the *trains de luxe* on the Continent, with doors at the ends and in the centre only. The carriages were divided by a transverse passage, and the corridor occupied opposite sides of the coach each side of the transverse passage. In the composite coaches of this design three first-class compartments were placed on one side of the lobby and five third-class compartments on the other; the brake third-class carriages were built with five third-class compartments. With sides that sloped slightly outwards from the roof down to the waist and large windows, these vehicles presented a very solid and substantial appearance.

In the later coaches, 70 ft. long, of slightly reduced width, a reversion to type was made with the restoration of doors to each compartment and corridors running an unbroken length on the one side. For comparative purposes the following table of the leading dimensions of an early third-class carriage, the large corridor third-class car just described, and Swindon's latest effort may be of interest :—

	Length.	Width.	Tare. T. c.	Compartments.	Seats.	
Early narrow gauge third class carriage	45 ft.	8 ft.	19 1	8	80	Flat roof.
Third class corridor carriage built 1905	69 ft.	9 ft. 6 in.	32 9	9	72	Elliptical roof, doors centre and ends only.
Third class corridor carriage built 1914	70 ft.	9 ft.	35 0	10	80	Elliptical roof, steel panels and sanit flooring.

Among the latest passenger stock constructed at Swindon Works, carriages 57 ft. and 70 ft. long have been built, the width keeping to the apparently permanently assumed one of 9 ft. In third-class corridor coaches this difference in length means a difference of two passenger compartments, 16 seats, the 70-ft. carriage providing 10 compartments as against 8 of the 57-ft. coaches, the leading dimensions of each reading :—

	Length over buffers.	Length over panels.	Width over handles.	Width over panels.	Tare. T. c.	Compts.	Seats.
Third class coach, Swindon, October, 1913	60 ft.	56 ft. 11¼ in.	9 ft. 5 in.	8 ft. 11¼ in.	28 4	8	64
Third class coach, Swindon, March, 1914	73 ft. 1 in.	69 ft. 11¼ in.	9 ft. 5 in.	8 ft. 11¼ in.	35 0	10	80

With the introduction of the large carriage, a well-known characteristic of Great Western carriages passed away, due to the substitution of elliptical roofs for the clerestory roof. For many years a feature of the express train stock, the clerestory roof made way for an elliptical roof as high in the centre as the clerestory with a wide radius of curve giving a greater cubic capacity.

Restaurant cars have changed, as may be supposed, to a marked degree from their prototypes. From a seating capacity of 25, in the case of early Great Western restaurant cars, the accommodation has risen to 42 seats in the new cars. Swindon's first design for dining cars placed the kitchen at the end, and later vehicles, 56 ft. and 68 ft. long, had the kitchen in the centre. Seats for 18 first class and 32 third class were provided in the cars 68 ft. long. Subsequently, in 1906, restaurant cars in which no discrimination of class was made were designed and constructed, 70 ft. long and 9 ft. wide, seating 42 passengers, with the kitchen at the end. Chairs of the movable type were provided, and the cars had double floors packed with cork in order to deaden sound. In 1913, Swindon Works commenced to build the newest series of Great Western restaurant cars, the first of which was put into traffic that year. Different in design and interior architecture and arrangement from preceding types, these cars have the dining compartment divided by partitions into three parts, accommodating 12, 18 and 12 passengers respectively, 42 in all. Fixed seats have been provided instead of the loose chairs. Built with flat sides, the cars are 70 ft. long and are carried on six-wheel bogies. Smooth and easy running is the great feature of these splendid vehicles, which may be said to embrace the last refinements of the carriage engineer's skill.

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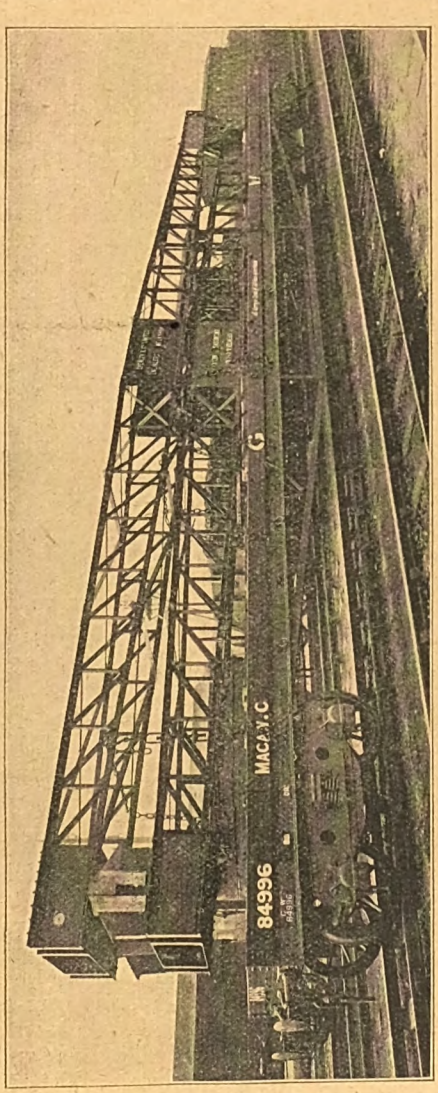
Sleeping cars are not much in evidence on British railways—the British public can mostly make their journeys within the kingdom from start to finish in less than 12 hours—but they are very costly to build, and the Great Western Company provide them for first-class ticket holders regularly on the night trains between London and the



70 FT. LOAD ON BOGIE BOLSTER WAGON.

West of England and South Wales, and also, should occasion arise, on special trains run in connection with ocean liners. The old Great Western sleeping cars were 46 ft. 6 in. long with six compartments each capable of accommodating two persons. In 1907, Swindon Works were responsible for sleeping cars on six-wheel bogies 70 ft. long and 9 ft. wide, with a tare of over 41 tons. Eleven compartments were provided, ten single and one double, the single berths being independent of each other unless otherwise desired. In these cars a kitchen was provided and the berths were furnished with many conveniences, including hot water and regulators to the steam heating apparatus, for controlling the temperature. Electric lighting was installed, and the double floor was packed with sawdust to assist quiet running, while special attention was paid to the ventilation. Later sleeping cars were built 57 ft. long, with nine compartments sleeping ten persons, constructed and finished in an equally luxurious manner.

Of the carriage stock built in the past 15 years all has not been of the corridor type. Many carriages have been constructed of the closed compartment class which, in other respects, are the equal of the new corridor cars. Some are allotted to suburban trains in the London and Birmingham local services, *e.g.*, in 1911 four trains consisting each of two composite and two brake third-class coaches, 57 ft. long and 9 ft. wide, bogie stock, were constructed especially for the heavy Birmingham suburban service; 70 ft. carriages have also formed trains for this working.

Luggage vans have been designed and built to match the appearance of the passenger-carrying vehicles, and in 1909 Swindon Works were responsible for a number 70 ft. long and 9 ft. wide on six-wheel bogies. In the wide cars containing guard's compartment, the side observatories were abolished. Post Office and mail vans have attained similar dimensions, and recent mail vans, with a tare of over 31 tons and a carrying capacity of 20 tons, have been slung on six-wheel bogies. Modern parcels vans 70 ft. long and 9 ft. wide have been constructed with louvre sides and four doors at each side; the tare of these vans exceeds 28 tons.

Slip coaches are made use of to a much greater extent on the Great Western Railway than on other lines, and to avoid the necessity of having to reverse slip carriages at the end of a run, the modern slip vehicles have been designed with slip guard's compartments at each end, the make-up of the car thus being: (a) slip compartment (guard and luggage); (b) passenger compartments (first and third); (c) slip compartment (guard and luggage). The latest slips are 70 ft. long with two first-class compartments seating 12 passengers, five third-class compartments seating 40

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passengers, and guard's and luggage compartment and lavatory at each end.

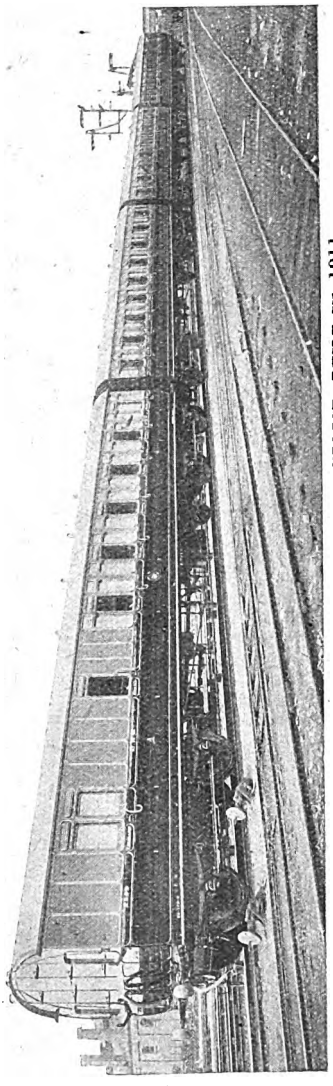
Apart from what may be looked upon as the normal day by day requirements for saloons, the Great Western Railway, serving as it does the upper reaches of the Thames, has to meet a big demand for this class of vehicle for the river-side traffic from the Metropolis during the months of June to September, and the stock has been largely augmented of late years particularly to cater for this business.

Of passenger train vehicles that do not come under the notice of the public, mention may be made of vans built for the purpose of carrying bullion. A steel bullion van was turned out of Swindon shops a few years ago.

A car used exclusively for the railway service is the dynamometer car. An adjunct of the Locomotive Engineer's Department, the chief purpose of this van is that of ascertaining the draw-bar pull of locomotives, and of carrying out various tests. The Great Western car is of the saloon type, and carried on four-wheel bogies. It is fitted with a flangeless wheel which, capable of being raised and lowered at will, rotates on the rail and operates the machinery connected with the speed-recording and other instruments. The apparatus registers the force of the tractive effort in tons and decimal parts of a ton, the rate of speed at which the tractive force is being accomplished, and the work performed by the locomotive in foot-pounds. Locality, *i.e.*, mile-post, quarter-mile-post, tunnel, etc., can be recorded by an operator, and details of the working of the engine can be recorded in the car by an observer on the footplate of the engine. By connecting a sensitive diaphragm in the dynamometer car by rubber tubes to an instrument placed in a neighbouring vehicle, the running stability of that vehicle may be tested. Details of the working of automatic brakes when applied are also recorded by apparatus contained in the dynamometer car.

Early to recognise the utility and economy of the rail motor car for minor branch and local services where the number of passengers to be carried is small, the Great Western Company in 1903 instituted its first service by rail motor car. Their use spread rapidly, and a further development of the idea resulted in the "auto-car" working, *i.e.*, a small engine fitted to work with a trailer car as a complete unit, driving from either end. Motor car and auto-car services are now in operation on all parts of the Great Western system, and from the first, with one or two exceptions, where for particular reasons two-class accommodation has been provided, the cars have given one-class accommodation only.

Auto-car services in the beginning were supplied by one trailer car with a small tank engine connected. Additional regulator gear is fitted to the locomotive by which it can be driven either from the footplate or from the driver's compartment at the end of the car. Standard connections are used and electrical communication is provided from the driver's compartment of the car to the engine, the fireman only being on the foot-



TRAIN FOR BIRMINGHAM SUBURBAN SERVICE, BUILT IN 1911.

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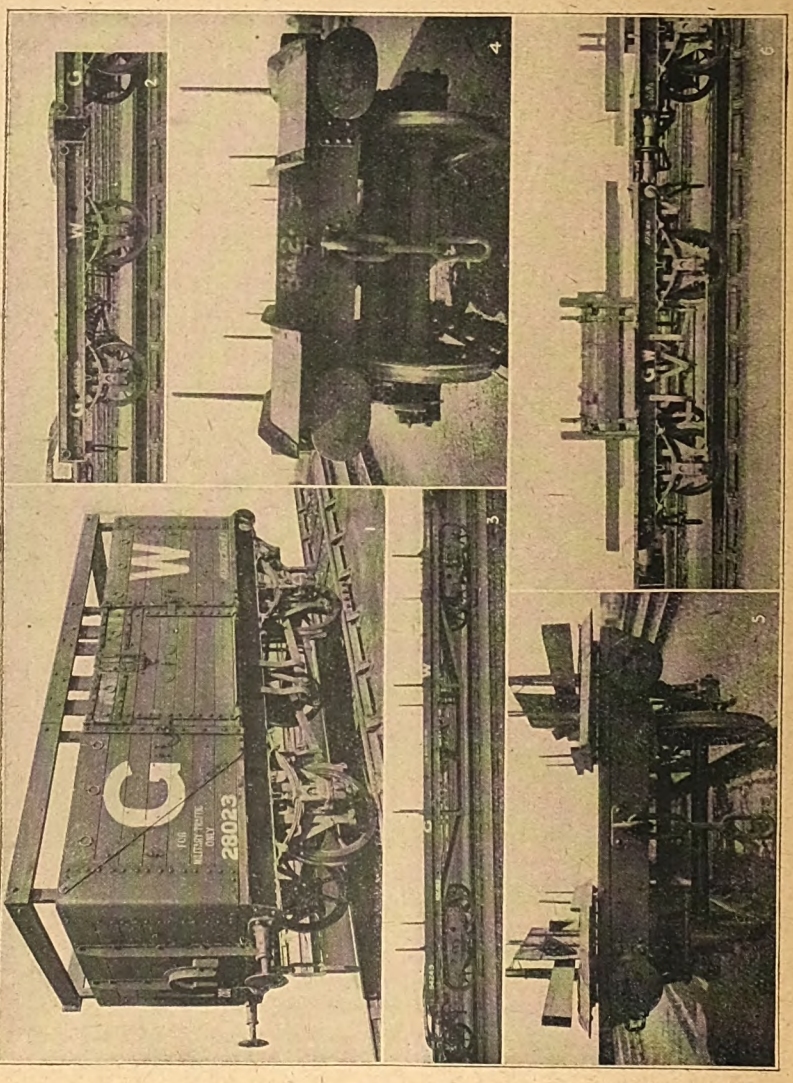
plate when the train is working car leading. An expansion of the original auto-car soon arrived, and in 1907 a four-car auto-train was at work in the Plymouth district. This was made up of four 70 ft. cars connected in pairs, with a small engine between the pairs, the complete train seating 312 passengers. The train could be reduced in size as wanted, drives a dynamo, which in turn transmits power to two electric motors on the axles of the car. Weighing only 14 tons, the car seats 44 passengers, the weight per passenger working out to about half that of a steam driven car. A petrol tank carried underneath the car holds sufficient spirit for working more than 200 miles, and the conductor's



EXAMPLES OF GOODS ROLLING STOCK ADAPTED FOR MILITARY TRAFFIC.

and to give the whole a uniform appearance the engine was covered with a movable frame matching in pattern the coaches.

In 1912 the Great Western Company put to work for experimental purposes a new petrol electric car built by the British Thompson-Houston Company. Power is provided by a 40 h.p. Maudslay petrol engine, which compartment contains electrical controller and brake control, enabling the car to be worked from either end, which convenience is one of the principal advantages of motor car working over the ordinary train.

Structural and internal architectural changes in passenger carriage design apart the equipment and fittings have naturally

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undergone transformation. Illumination furnished by oil lamps was sparingly supplied to old vehicles for many years, oil gradually giving way to compressed oil gas. In the last dozen years the lighting has been improved out of all comparison by the use of incandescent mantles and electricity. A local train working in the London district to and from the city was the first train on the Great Western system to be fitted with incandescent burners, in 1905, and the Royal train was the first to be supplied with electric light, in 1897. Some time elapsed before anything further was done to utilise electricity for train lighting, but in 1900 and 1901 two new buffet trains, and in 1904 a train for the Birmingham local service, were so illuminated. About that time exhaustive experiments were made between rival systems of electric lighting for trains and the merits and faults of each carefully balanced. Electric lighting is now the rule for modern cars—although its adoption had a check when incandescent mantles suitable for railway carriage illumination were invented objections to it, and there are a number of serious ones, among the principal being that the necessary energy must be generated by the train, being considered outweighed by its advantages. Besides using it for new stock, the Great Western Company is substituting electric light apparatus on carriages previously lighted by gas lighting. Trains specially built in 1911 for the Fishguard and London working in connection with the Cunard liners calling at Fishguard had the electric lighting apparatus fitted in accordance with the Great Western Railway's Electrical Engineer's design, whereby dynamos were placed only on the end and centre vehicles, the intermediate coaches obtaining the current from those.

Most important of changes effected in carriage construction recently is the incorporation of steel panels and fireproof flooring in the superstructure, and Swindon coaches of modern make embody these elements. The base of the floors is formed of sheets of galvanised corrugated steel, rivetted together and secured to the lowest member of the side framing of the coach. On the top of this are fastened expanding metal sheets, and on the bed thus formed the fireproof flooring is laid to an average depth of 1 in. When dry the material forms a hard fire-resisting substance. Galvanised steel sheets case the sides and ends of the coaches. Express trains are provided with first-aid outfits and an equipment of fire extinguishers, crow-bars, axes, etc., for emergency use in the event of an accident happening to the train.

Ventilation was the subject of careful study about the time the large coaches made their appearance, and in the cars built since then "hit-and-miss" extractors fitted to the roof have supplemented the ventilators over the windows. For some years the steam-heating of carriages has been carried out on an improved method by means of cast-iron radiators, and is under the control of passengers through the regulators fitted in the compartments.

Another change in the equipment is that of the substitution of the chain communication between passengers and train staff for the cord communication. Whereas the old cord communication necessitated a passenger groping about outside the window, the chain equipment now provided is readily reached inside the carriage, and is available at both sides of the coaches as against the one side on which the cord ran. Upholstery has changed, the tapestry of rather sober colour giving place in 1909 to a more cheerful colour when new pattern upholstery was used. Among many other conveniences supplied to passengers, hot water in the lavatories is not the least.

As has been said, slip-carriage working has been developed on the Great Western Railway more than on other British railways, and the method of slipping with the new apparatus brought into use in 1909 deserves more than passing mention. The method in vogue before the adoption of the new system was very awkward compared with the new style, requiring as it did the slip-carriage guard leaning out of the window facing front in the slip compartment to seal the automatic brake pipes of the rear vehicle of the main train and of the slip by means of cocks, and separating the pipes before liberating the slip coupling. As modified, the apparatus, besides accomplishing the separation of the brake pipes, admits of the vacuum brake being released after its application on the slip portion, which was not possible with the old method, thus affording better control of the slip. The slip cock joining the brake pipes of the main train and slip is made in two portions which keep securely closed when the train is intact, but which separate when the coaches are parted, a spring valve in the portion attached to the main train pipe automatically closing and sealing the vacuum brake pipe. When the slip guard pulls the lever releasing the

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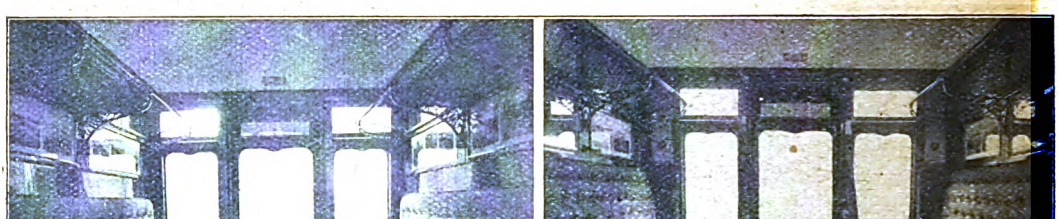

INTERIOR VIEWS OF TRAINS FOR BIRMINGHAM SUBURBAN SERVICE BUILT IN 1911.

couplings, the action of pulling the slip lever not only draws the bolt from the slip link, but also opens a valve which admits air into the brake pipe of the slip, thus applying the brakes and causing the slip portion to drop back quickly from the main train. By reversing the slip lever the vacuum of the slip portion can be restored and the brakes released. This effect is produced by the action of the lever operating another valve in such a manner as to place the vacuum cylinders in communication with other cylinders which, when this valve is opened, draw out from the brake cylinders the air previously admitted, and this has the immediate effect of taking the brake off.

Advance in the design and construction of passenger train rolling stock other than carriages has kept pace with that of coaches. Horse boxes have been bettered in design and increased in size from 14 ft. in length to 16 ft. and then to 21 ft., the tare rising from about 7½ tons to 8½ tons and 10½ tons respectively, and in the newest of Great Western horse boxes a compartment for luggage as well as the groom's compartment has been added. Covered carriage trucks from the original four-wheeled vehicles 16 ft. long, with a tare of 7 tons, increased in length to 27 ft. 6 in. and a weight of over 9 tons in 1891, a later lot carried on six wheels, with a tare of 12 tons, going to 30 ft. in length. These were surpassed when covered 8-wheel carriage trucks 50 ft. long were built at Swindon, having a tare of 22–23 tons and capable of carrying 10 tons. Open carriage trucks have developed from vehicles 16 ft. long to 21 ft. and 45 ft. and then to 50 ft. in length, the 45 ft. and 50 ft. vehicles being carried on four-wheel bogies. Carriage trucks, both open and covered, of the 45 ft. and 50 ft. class are found particularly useful for the conveyance of lengthy pieces of theatrical scenery.

Vans built for the carriage of milk, poultry and fish by passenger train are among the most useful all-round vehicles to be found on a railway; their utility is not to be excelled. They can be used for the conveyance of almost anything, and on occasion do emergency duty for luggage vans. Of those 28 ft. long, some have four and others six wheels, and the upper part of the sides of some of them are of the louvre pattern. Among newer types are bogie vehicles 40 ft. long, with a tare of 22½ tons, but the latest product of Swindon Works in this class of van went to a length of 50 ft., with a tare of 25½ tons. In design the eight-wheel milk trucks vary greatly from the original type, having sides close boarded part of the way up, with louvres above, whereas the older vehicles have open boarded sides. By the close boarding and louvre arrangement rain is excluded, while ventilation is maintained. A novelty of substantial value in these new vans is the covering of the floor boards by rock asphalt sloping slightly towards a gutter in the centre. This arrangement facilitates the cleansing of the vehicles, the water being carried away by lead pipes.

Modern milk vans are designed for loading at the ends as well as at the sides, and are illuminated from the roof, while the latest eight-wheelers are built with corridor gangways. Of fruit vans built for passenger train working, a good number are gas lit, and most of these are provided with the automatic Westinghouse brake as well as the automatic vacuum brake, as are many of

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the cattle trucks built for passenger train working and used for the conveyance of prize and show cattle.

Goods trucks in many classes do not show variations of general design so apparent as passenger carriages, but of late some important innovations have been made. In 1867 the first wagons, consisting of open trucks 11 in. deep were built by the Great Western Company, and two years later trucks of double that depth were constructed. In 1879 iron frames were used. It was not until 1886 that the depth of wagons was increased, when trucks with a depth of 2 ft. 4 in. were made, raised to 2 ft. 11 in. in 1902, in which year the introduction of sheet supporters for open wagons became general. An important departure from practice was made in 1890 by the construction of a 30-ton rail truck on bogies; locomotive coal wagons to carry 20 tons were provided in 1897, and later wagons of 40-tons capacity were put to work.

The variety of goods vehicles is evident when it is noted that, in addition to the common open and covered goods wagons trucks have been specially constructed for the conveyance of live stock, meat, fish, fruit, glass, explosives, timber, road vehicles, girders, boilers, guns, armour plate, machines (agricultural, etc.), propellors, rails, and other articles.

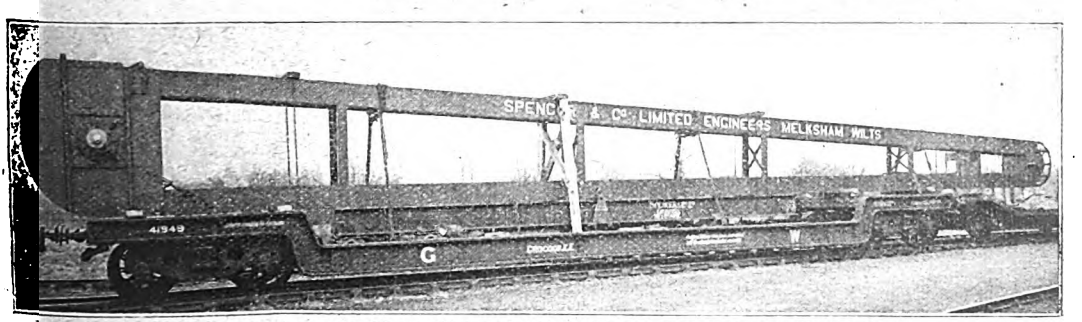
Of the special class vehicles, of which there are about thirty varieties, remark may be made of trucks designed for the carriage of boilers, girders, etc., and trolleys to carry 15, 20, 25, 35 and 40 tons; rail trucks to carry a load of 40 tons, and armour plate and roll wagons to carry 45 tons. Recent additions to the stock of timber-carrying vehicles include bogie fitted trucks to bear a load of 30 tons, and 45 and 70 ft. in length, and ordinary open goods wagons on four-wheel bogies to carry 25 tons.

The principal dimensions of a 20-ton boiler truck are given below. Twenty tons is the capacity of the trucks with weight distributed in the well, but they are designed to carry 35 tons over bogie centres or 10 tons at centre of well.

Length over headstocks	62 ft.
Centres of bogies ..	51 ft. 6 in.
Clearance in well ..	40 ft.
Width between boom plates	6 ft. 6¾ in.
Total width	8 ft.
Weight	24 tons 17 cwt.

The 35-ton boiler truck is 15 ft. shorter in length and clearance in well, and the truck built to carry 40 tons in the well has only a 55 ft. clearance in well.

Probably the most significant event in the history of the goods wagons has been the fitting of the automatic vacuum brake to trucks, making possible long distance high speed goods trains under control equal to that of passenger trains. Trucks for the carriage of road vehicles and machines, such as traction engines, have been equipped with the automatic brake, so that they can run in passenger trains, for some time past; but with the advent of ordinary goods and cattle trucks fitted with the automatic brake apparatus a class of goods and live stock train was workable far superior to any previously tabled. A necessary corollary to the vacuum brake on goods stock was the substitution of oil axle-boxes for grease boxes. Another improvement in covered goods trucks was the ventilation allowed for by recent designs and the application of steam heating to them. Steam heating of goods vans was undertaken when the Royal Mail Steam Packet Company inaugurated a regular service of vessels sailing between Avonmouth and the West Indies, bringing bananas in large quantities from Jamaica. To reach the consumer in good condition bananas require to be kept at an even



GRAIN ELEVATOR JIB, 83 FT. 5 IN. LONG, LOADED ON BOGIE WELL TRUCK.

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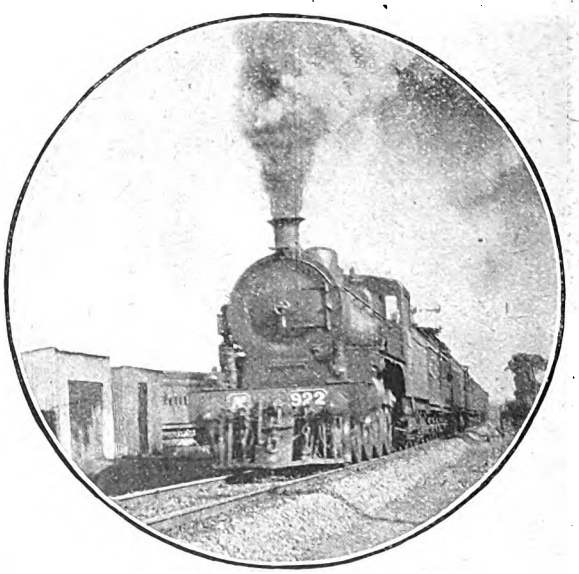
temperature of about 50°; if once chilled they never ripen properly.

Hand brakes on goods trucks were the subject of a Board of Trade regulation in 1911, when an Order issued under the Railway Employment (Prevention of Accidents) Act, 1900, was made to the effect that within stated periods all railway wagons not otherwise exempted were to be fitted with brake levers on both sides, which, while capable of applying the brakes on either side, will admit of release only from the side on which applied. This rule exempted from its scope "all wagons fitted with the 'Dean & Churchward' brake as described in Specification No. 202 of 1902, if arranged as a cross-cornered brake." The exempted brake referred to had been for years the standard brake of the Great Western Railway, and the appliance is capable not only of applying, but also of releasing the brake from either side of a vehicle, in that way going further towards an ideal either-side brake than that prescribed by the Board of Trade Order.

War influence has caused the stoppage of railway carriage construction except coaches for ambulance train purposes, of which a number have been built, and other vehicles converted, to suit requirements. In August, 1914, the demand was for an ample supply of vehicles of various descriptions for the transport of horses, carts, motor vehicles, guns and material. The serviceable number of special class trucks owned by the Great Western Railway was then, and has been since, of inestimable value, and for the rush at the time of mobilisation vehicles of various classes were hastily adapted to the pressing needs of the time. High-sided open goods trucks were fitted with a top rail heightening the sides sufficiently to render them suitable for the conveyance of horses; "twin" timber trucks had the bolsters removed for the conveyance of guns and were provided with ramps at the ends to enable loading to be done from the carriage shoots; bogie rail trucks 45 ft. long and constructed to carry 30 tons had the bolsters removed for conveying guns, transport wagons, etc., and were fitted with ramps for end loading, and a number of partly constructed open wagons without sides or ends were fitted with part sides and end ramps for the work of carrying guns, carts, etc. Swindon Works were never so busy in the wagon shops as during that feverish month of August, 1914.



Photo] [*W. E. Brookes.*

VICTORIAN GOVERNMENT RAILWAYS.

4-6-0 Locomotive leaving Ringwood Station.

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The Western Lines of the London and South Western Railway. [No. II.]

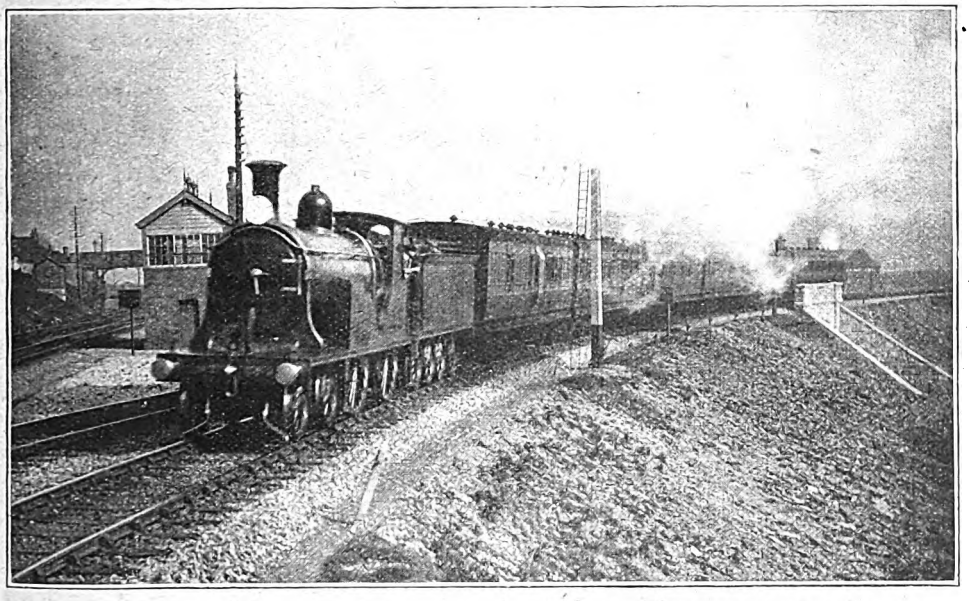
By J. F. GAIRNS.

(*Continued from page* 44, *January* RAILWAY MAGAZINE.)

CONTINUING from Bere Alston towards Plymouth, a fine view is had of the broader reaches of the Tamar, for the railway is still located very high, and onwards to Bere Ferrers, another place in great favour with residents in the "Three Towns" for picnics and excursions, the traveller has spread before him an everchanging panorama of hill-country beauty, in many places with dense masses of foliage, and the continual presence of profuse and picturesque vegetation. Here and there rocky cuttings are traversed, and as the line curves a good deal, the aspect is continually varying. The railway is gradually descending between the converging estuaries of the Tamar and the Tavy, two of the most picturesque rivers of the "Garden of the West," and they add greatly to the scenic interest of the route.

Beyond Bere Ferrers a four-span viaduct and girder bridge carries the line over the Tavy, just where it joins the Tamar, close to Tamerton Foliot station, with another viaduct beyond over a wide arm of the river, and thence nearly to St. Budeaux the railway follows closely the water-side, frequently being directly on the verge of the Tamar, which is here of considerable width. Shortly before reaching St. Budeaux station the line passes on the water-side under the famous Saltash Bridge, but far below it, giving, perhaps, the finest view of that Brunel masterpiece.

Turning inland, the Great Western becomes a close neighbour, with stations side by side at St. Budeaux, though they are in separate cuttings. At Ford the valley is crossed by a high stone viaduct, and one has, over the roofs of the houses in what is now a



Photo] [*Lieut. B. D. Holberton, R.N.*

TRAIN PASSING LIPSON JUNCTION, PLYMOUTH.
4-4-0 engine No. 292.

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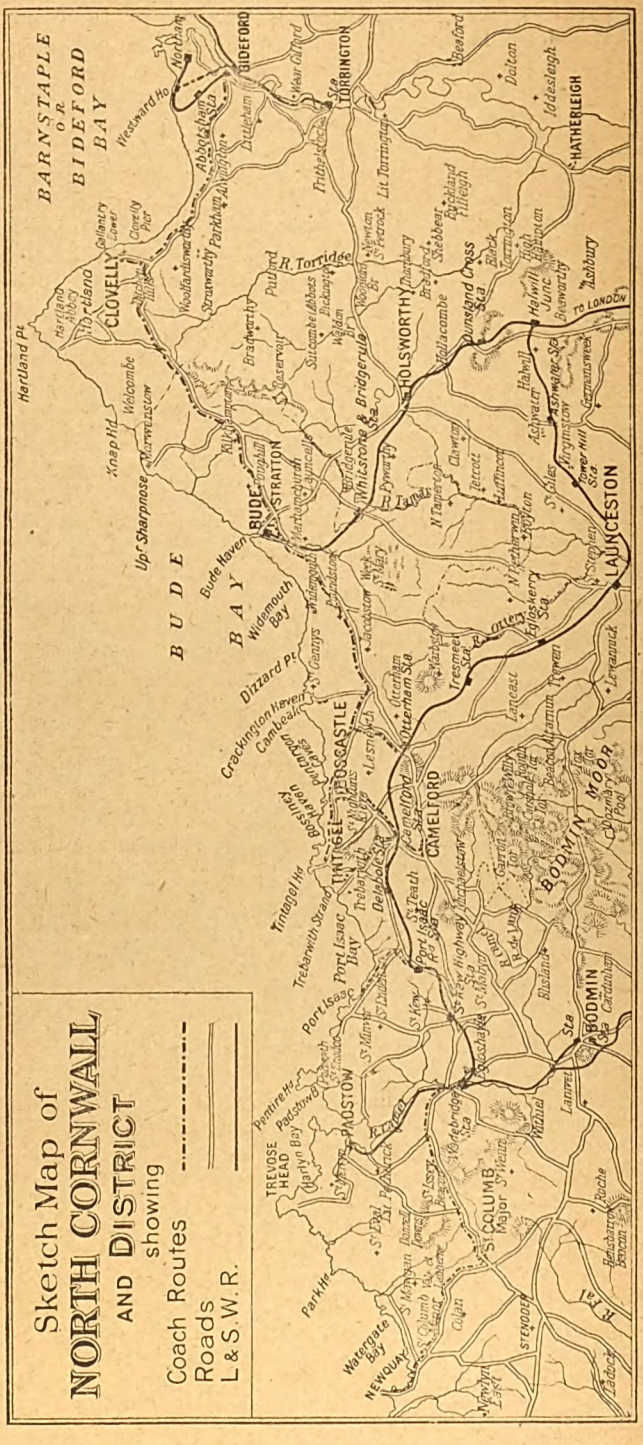
densely populated area belonging to Devonport, a fine view of the Great Western viaduct near Keyham station, and of the high arched road viaduct alongside.



Albert Road "halt" is in deep cutting, between two tunnels. The station at Devonport is a somewhat remarkable structure. This was the terminus when South Western trains travelled over the Great Western Railway from Lydford *viâ* Yelverton, entering Plymouth in the opposite direction, and passing through Mutley and North Road to reach Devonport. Consequently the two platforms are widely separated, each under a section of the roof, which is in two longitudinal bays, with terminal siding roads between. The through lines emerge through arched openings in the old end walls, against which are the stop blocks for the middle siding roads mentioned. The station is well equipped with refreshment rooms and usual offices; and as it has an effective outside elevation and approach road, as befits a station erected not so many years ago as a terminus in an important town, it is a most creditable station in every way.

Devonport is a busy station for the London and South Western Railway, and adjacent are goods yards and access to the dockyard, together with lines leading to Stonehouse Pool, where a few years ago special equipment was provided to deal with trans-Atlantic traffic landed at the Ocean Quay. A short run and the Great Western Railway is joined near to North Road station, whence running powers are exercised to Laira Junction. North Road ranks as the principal station in Plymouth itself for South Western traffic. Here the situation at Exeter is paralleled in that "corresponding" South Western and Great Western trains are

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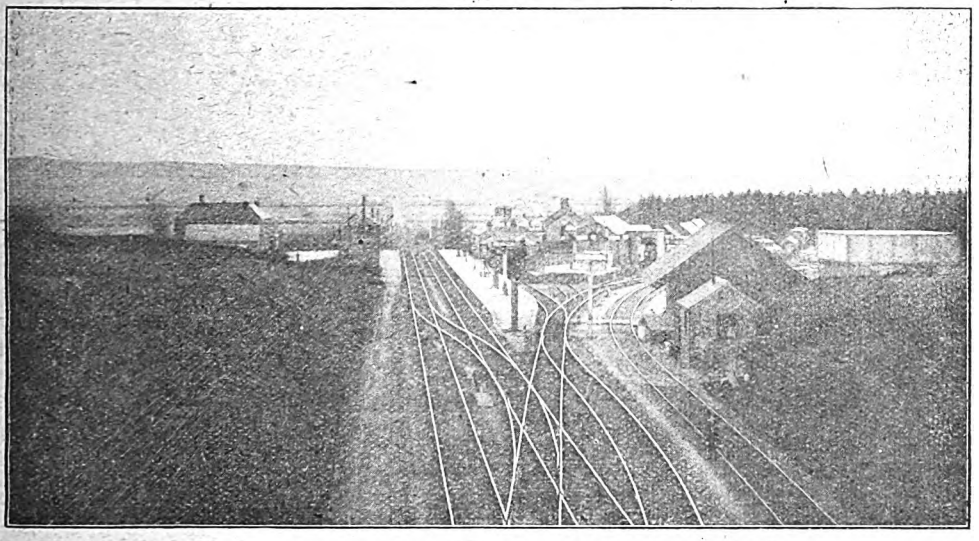
travelling in opposite directions. There is considerable interchange between the two companies.

Through Mutley the same lines are used by all trains until at Laira Junction London and South Western trains curve away towards the Friary terminus, in the industrial portion of Plymouth. There is not a great deal of passenger traffic dealt with at Friary, though there is a well-equipped station there, under Mr. Lodder, but it is useful for terminal work, besides being convenient for some parts of Plymouth, while the approach lines also give access to the Cattewater goods depôt and to some of the docks, as well as serving a number of industrial establishments in the district. In the summer large numbers of school excursions are here dealt with, while the oversight of coaches and the management of the goods facilities renders the direction of the Friary terminus no insignificant undertaking.

In addition to the main line trains a service of motor-trains is operated from Friary through the Plymouth district as far as St. Budeaux—one run, usually worked by a standard tank engine and coaches, is right through to Tavistock and back—and these call at the Lipson Vale (near Laira halt, Great Western Railway), Albert Road, Camel's Head, and Weston Mill halts, in addition to the stations. There is also a service of motor-trains to Plymstock and Turnchapel, on the other side of the Cattewater. These diverge near the Friary engine sheds, and after rising on a steep grade—single line—to Lucas Terrace halt (overlooking the main lines) turn sharply eastward and, joining the Great Western lines from Laira Junction (there are busy goods lines and sidings of both companies complicating this area), cross the Cattewater by a long single track girder viaduct and then traverse a rocky area to Plymstock station. This is of V-shape, Great Western motor-trains to Yealmpton taking one side and South Western motors for Turnchapel the other. The somewhat attractive residential district of Oreston is then served by a halt, near which some stone quarries may be noted. At Turnchapel the line is continued for a short distance through rock cutting for goods traffic. The Turnchapel motor gives at least an hourly service in each direction, and is frequently about half-hourly, as the complete run only occupies 10 minutes each way. But although the journey is short, the route is a very useful one, as it connects the two banks of the Cattewater, while Turnchapel itself is a favourite place for a run out for picnic purposes with poorer families, the return fare being only threepence. The district is, moreover, distinctly attractive on its own merits, though one has to get away from the station before this can be appreciated.



HALWILL JUNCTION.
Looking towards Okehampton, with the moors in background.

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NO. 1. LAUNCESTON STATION, LOOKING TOWARDS PADSTOW.
NO. 2. BUDE STATION, LOOKING TOWARDS OKEHAMPTON.
NO. 3. PADSTOW STATION, HOTEL METROPOLE IN BACKGROUND.

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THE NORTH CORNWALL LINE.

It is now necessary to return to Okehampton in order to follow the North Cornwall lines to Holsworthy and Bude and to Launceston, Wadebridge, Bodmin and Padstow.

Leaving the Plymouth route after crossing the Meldon Viaduct, the North Cornwall line —a separate company worked by the London and South Western Railway—diverges at Meldon Junction, 2 miles 52 chains from Okehampton, and immediately becomes single track, which is the general character of the whole of this section. It is a long run from Okehampton to Ashbury station—8 miles 50 chains—so that an intermediate crossing place is provided at Maddaford Moor. From Meldon Junction the line curves away on high embankment and, looking back, one has a splendid view of the tors of Dartmoor behind, while on either side are stretches of heath and moorland. At Maddaford Moor there are few signs of habitation, but from Ashbury to Halwill Junction agricultural interests begin to manifest themselves. At Halwill Junction there are the usual two platforms, with a bay on the down side to accommodate the Bude connecting trains. There are several sidings to suit traffic requirements, and also to allow of a goods train being cleared from the running lines. The correct name of the station is " Halwill and Beaworthy," but it is generally referred to, even officially, as Halwill Junction, in order to indicate its character.

Thence to Holsworthy is the older portion of the line, the apparently more important Padstow route being of later construction, and even now, during the holiday season, it is the Bude traffic which is heaviest on the passenger side in view of the favour which that place is now receiving. The two routes diverge a short distance from Halwill Junction station into two single track sections.

Following the Bude section one has some fine views over the moorlands, but the country becomes more verdantly picturesque and near Dunsland Cross is very pretty, with the high hills as background. The approach to Holsworthy is decidedly favourable to the relatively busy town—the first terminus of the branch—built on a hill crowned by Holsworthy Church. To reach the station a deep valley is crossed by a notable concrete viaduct, while just beyond is another viaduct of interesting character. The town is a centre for agriculture, with a population of about 3,000, so that adequate goods yard and siding accommodation is necessary, while the station is a very creditable structure. The town is also famous for horse-breeding, while as a tourist centre it has much to commend it.

Passing now through agricultural country, Whitstone and Bridgerule station heralds the approach to Bude, tickets being collected there. The final run includes the traverse of a rather deep rock cutting, and its concluding stages give some fine moorland views, and in crossing a high viaduct one can see across to Widemouth Bay, with a glimpse of Bude Haven later.

Bude station includes rather pretty buildings, with the usual equipment—including refreshment room—and consists of one main platform with a bay at the side. It is really in the village of Stratton, and to reach Bude itself one has to follow the road alongside the Bude, Holsworthy and Launceston Canal for about half-a-mile. To those who have not visited Bude it is not easy to understand why it should have come so much into favour as it has done in recent years. But inspection provides adequate explanation—it combines within a limited radius for a multiplicity of holiday requirements, and is, moreover, suited for those who desire a quiet resort with natural beauty, and not too many of nature's difficulties, besides appealing very strongly to the followers of the " Royal and ancient game " of golf.

The Haven itself is an inlet between the high cliffs of the coast, and provides a beautiful stretch of soft and white, yet firm, sand leading down to the narrow stream which represents the Bude River at low tide. This is about all there is of the river, as the rest of the stream has been incorporated in the Canal above-mentioned. This terminates in a lock, inside which is a basin for such shipping as is now dealt with. To the north of the Haven the sands lead to a bunch of rocks which can only be described by the suggestion that at some remote date " Thor's Hammer " had been employed breaking down a mass of rocky cliff. These rocks are a never-ending source of interest to the younger generation, while a little further along, and on the other side of the Haven, are real cliffs of considerable height. Overlooking the Haven, with slopes leading gently down to the sands, are the famous Summerlease Downs golf courses—one of 18 holes and two of 9 holes—the remaining stretches of downs leading across to Stratton being in high favour with general visitors. As all these attributes are contained within

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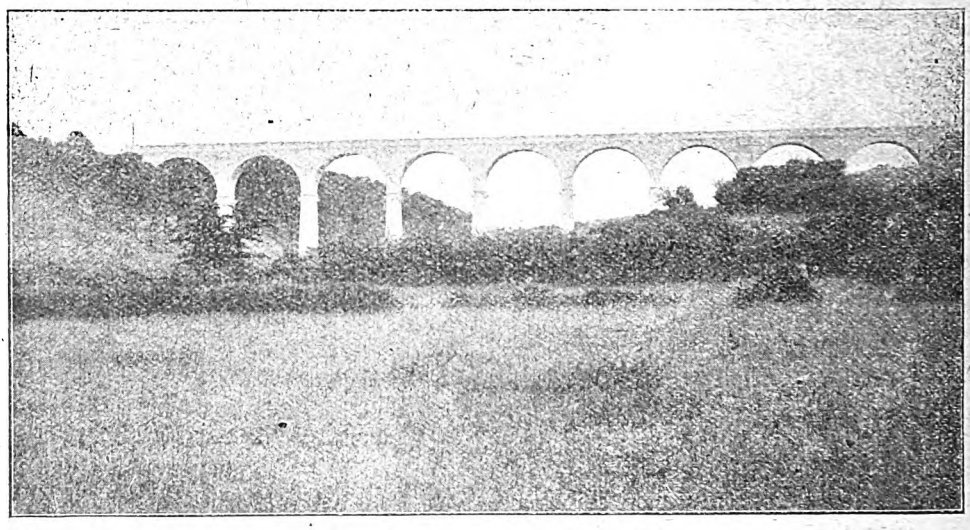
a radius of less than a mile, and there are none of the rocky paths and steep roads which characterise so many of the Devon and Cornwall resorts, one begins to realise how it is that Bude, or correctly Bude-Stratton, has become one of the favourite resorts of the west. There are also many places of interest in the vicinity, notably Widemouth Bay, Moorwinstowe, Crackington Haven, Tremoutha Headland, and the massive promontory of the Cambeak, for the benefit of those who wish to go further afield, while the North Cornwall coaches run from Bude to Clovelly on the one side, and to Boscastle, Tintagel, Otterham and Camelford on the other.

Incidentally, Bude is the *locale* of one of the very few "edge-railways" to be found in the United Kingdom, and this, moreover, apparently belongs to a fairly late date, and is not a historic relic, as are most of the others. It is used for conveying sand to the lock basin for transhipping into coasting vessels, or into railway wagons as the case may be. There is about half-a-mile of line, with an apparently little used intermediate crossing place, fitted with pivoted vertical flange sections as required by the edge-rail system. The line commences right on the beach, and then follows alongside the lock to the basin, where it divides into two lines, one allowing for side-tipping to the waterside, the other on a bank overlooking a low level railway track so that ordinary railway wagons can be loaded. The tip wagons have cast iron wheels adapted to run outside the flanges of the edge rails. The line is, of course, worked by horse-power. The standard railway track referred to is continued alongside the canal to the goods yard at the station.

To compensate for the absence of sea-boating facilities—the sea is too dangerous for this, though bathing in the Haven is both safe and good—the Canal, which is very picturesque in places, is utilised locally for boating.

Returning now to Halwill Junction, the Launceston and Padstow line calls for attention. Curving away from the Bude section, a fast run is made to Ashwater, through semi-agricultural but hilly country, rounding the base of a pretty tree-clad eminence near the station, following the Carey River, which is a close neighbour past Tower Hill station and nearly to Launceston. Approaching the latter station the Great Western line from Lydford and Tavistock is crossed by a girder bridge, and in the town itself the two stations are close together. The South Western line continues in a deep cutting through the town, with the goods yard beyond, and some pretty views are had onwards through Egloskerry and Tresmeer, first of tree-clad hill slopes, and then of relatively bare heath and moorland. This section is very sparsely populated, though these stations are centres for wide areas. Otterham and Camelford, too, possess some of the same characteristics, but



Photo] [*F. Rowland.*

HOLSWORTHY VIADUCT.

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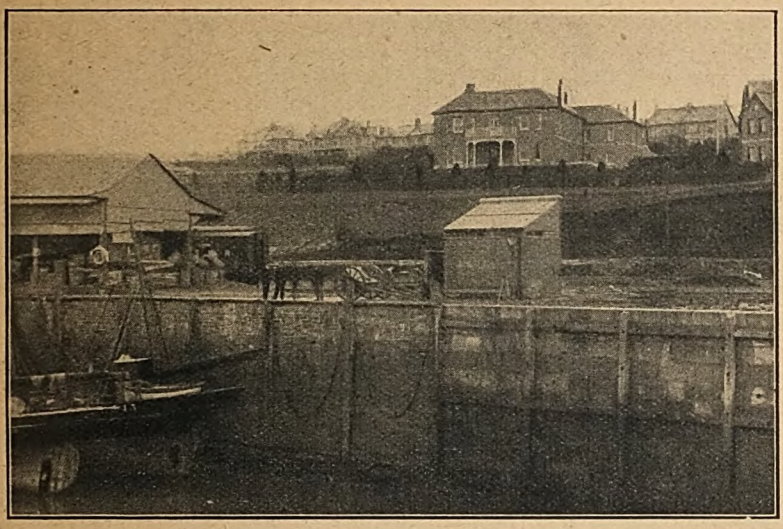
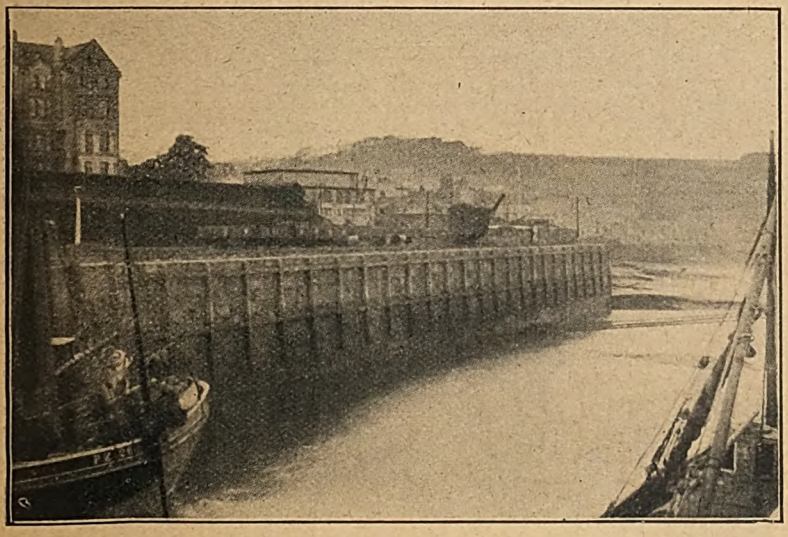


ALONGSIDE THE FISHMARKET, PADSTOW.

they are, in addition, centres for coaching tours to Bude, Boscastle and Camelford, while they are convenient for Row Tor, Brown Willy and other heights.

Approaching Delabole is somewhat of a sensation, as the line skirts the brink of the famous slate quarries, which have been worked for over 200 years, and one looks down into these great excavations. The town itself affords plain evidence of its industrial character. The line continues through Port Isaac Road, whence a coach service runs to the favourite resort of Port Isaac, and *viâ* St. Kew Highway to Wadebridge, following the course of the Allen River for some distance. The Bodmin line is joined a few chains east of the new station constructed at Wadebridge, the two routes being operated as separate single lines until the home signals of the station are reached.

Wadebridge is the traffic centre for the district, having adjacent to the station—one down platform and an island for up trains—fairly extensive sidings and engine sheds. The town is of considerable size, and as the yard also has to deal with the traffic from



ENTRANCE TO PADSTOW HARBOUR.

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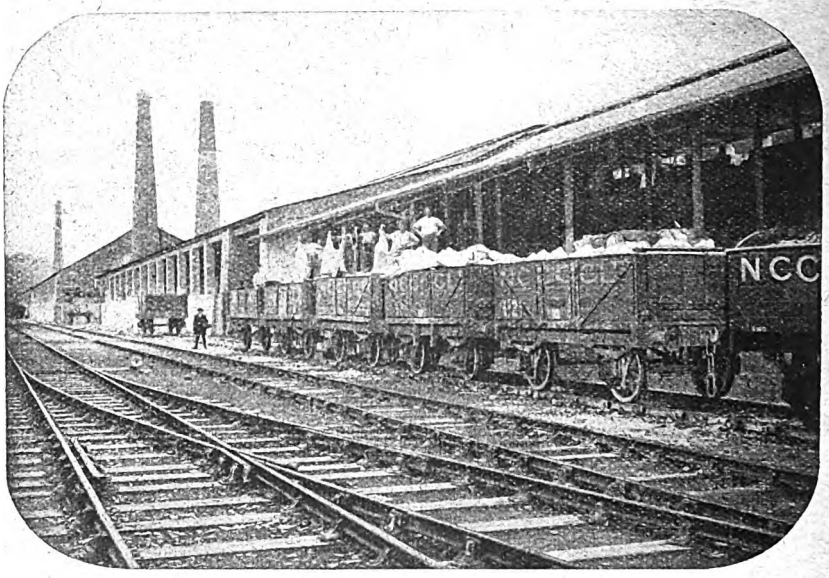
Padstow and to and from the Bodmin line, Mr. Brown, the stationmaster, has no sinecure. Great Western motor-trains from Bodmin use the South Western station; and there used to be a separate staff, but this is not now maintained. The cattle-market at Wadebridge is an important one, while there are several industrial establishments. At one time the town was also important for water-borne traffic—this is one explanation of the construction of the Bodmin and Wadebridge line—and dealt with the china clay traffic from Wenford Bridge, but this now goes through by rail to Padstow, so that the mouth of the Camel at Wadebridge is by no means so busy with small coasting vessels as it used to be. The famous bridge of 17 "fair and great uniform arches of stone," erected in 1485, although widened, presents very much its original appearance. Wadebridge is a fine centre for tours, and the North Cornwall coach runs from it to Newquay.

Adjacent to the station platform can be seen part of the old engine shed of the Bodmin and Wadebridge Railway, now incorporated into stables, while outside the original buildings of the carriage shed can be identified.

Continuing through the town of Wadebridge, crossing the main street leading to the bridge by a level crossing, the railway to Padstow follows the estuary of the Camel for 5½ miles without an intermediate station. It is built throughout on the verge of the waterway, except for an occasional cut through a headland, and provides magnificent views over what becomes a fairly wide estuary, with many picturesque heights beyond. Two arms are crossed, one by a viaduct and the other by a girder bridge. Interesting rock cuttings are also involved in places.

Padstow is an ancient fishing port which is now regaining some of its old importance under the auspices of the London and South Western Railway, as lessees of the North Cornwall Railway. The best view is had from Rock, connected by ferry with Padstow.



THE FINISH OF A LARGE SHIPMENT OF CHINA CLAY FROM WENFORD.

The station is cut out from a rocky plateau, crowned by the Metropole Hotel. It has one platform only, but adjacent are the fish quays and fish market, premises let to the various fish and shipping supply merchants, and fairly extensive sidings.

From the tourist point of view Padstow is a good centre for trips to Bedruthan Steps, to Newquay, locally to pretty little Trevone, two miles from Padstow but facing the Atlantic in the midst of fine coast scenery, to Harlyn Bay and Trevose Head. Across the estuary are Rock, the St. Enodoc golf courses (close to the quaint church which has been several times buried by sand), Polzeath, Pentire Head and Padstow Bay.

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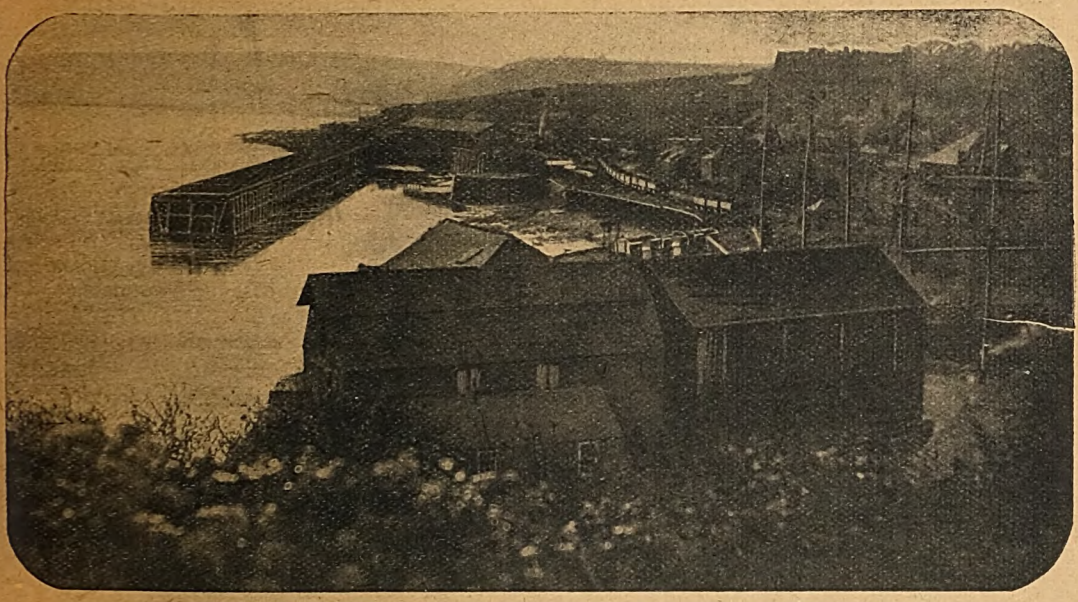
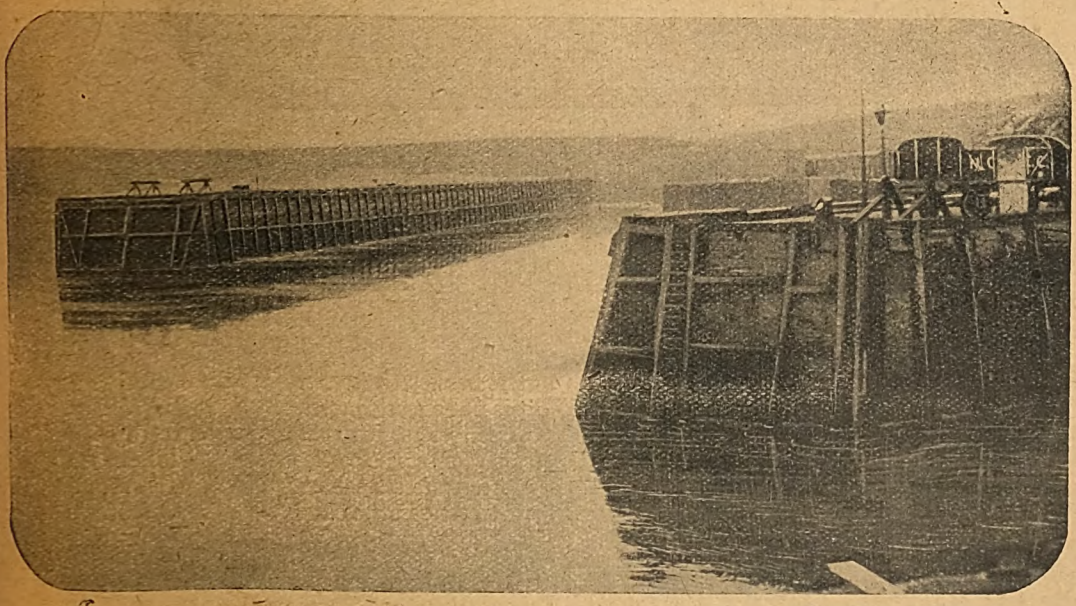


GENERAL VIEW OF PADSTOW, WHENCE, *inter alia*, CHINA CLAY FROM THE WORKS OF THE NORTH CORNWALL CHINA CLAY CO., LTD., WENFORD, LOADED FOR SHIPMENT BY SEA.

The fish market at Padstow is a continual source of interest, and many visitors come down to view the proceedings. It is a common thing for 40 to 50 tons of fish to be sent off in a day, while in the special seasons there may be 200 tons in 24 hours, requiring 50 or more vehicles for all parts of the country. Frequently, too, smart work is done, boats coming in, unloading their fish, this is sold, packed, loaded into railway vehicles and despatched in record time, in order to ensure that the fish is sent off by a particular train.

The fishing harbour is immediately



THE NEW PIER, 830 FT. LONG, CONSTRUCTED AT PADSTOW.

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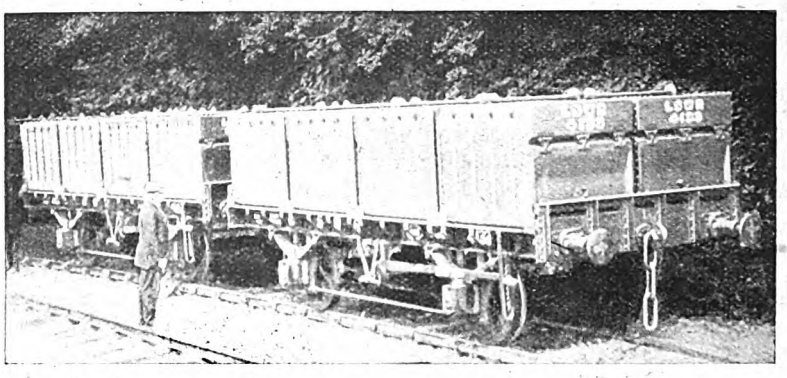
alongside the market and the station, but is being extended and special equipment for dealing with coal and china clay is being provided, so that in due course Padstow will take its place among the best "modern" harbours of the west country. Further down are coaling berths supplying the steam drifters and other vessels. The outer wall is used for transhipping china clay from Wenford Bridge, and for this purpose a system of containers is adopted to some extent, these being loaded on wagons for rail transit and are constructed for direct tipping of the clay into the hold of the vessel.

Inner and outer walls of the harbour are being extended to form a wet dock, and lock gates will be fitted so as to be independent of tides and to obtain a fixed water level. As Padstow is adjacent to very rich fishing grounds, and in regard to boats operating on the west coast, avoids the voyage round Land's End to reach South Cornwall ports, its future seems assured in this respect, now that in the hands of the railway company suitable and adequate provision is being made. Moreover, the port is becoming an all-the-year-round one, and not merely seasonal. An ice-works (North Cornwall Ice Co.) adjacent supplies necessities in this respect, and incidentally also provides electric light, not only for the harbour and station, but also for the Hotel Metropole and part of the town.

Mr. Stretch, stationmaster, has charge of all the work of the station and of the fish and goods traffic of the harbour, with a Harbour Master in control of the shipping. It may be mentioned that Sir Charles Owens, late General Manager, London and South Western Railway, is one of the Padstow Harbour Commissioners.

It is hardly necessary to refer to historic aspects of the Bodmin and Wadebridge branch, as this has already been done very fully in the RAILWAY MAGAZINE, but some attention on modern lines is necessary to complete this section. Leaving Wadebridge, the Bodmin line diverges to follow the course of the River Camel, whereas the line to Launceston keeps company with the River Allen, and runs first to what is known as Grogley halt. On the way some very pretty scenery is passed. The Bodmin and Wadebridge Railway and curves may be considered as synonymous, but many of the almost innumerable curves of the old line have been eased in reconstruction, carried out in 1865. Here and there indications of the old line can be traced, but most of them have now to be looked for, though where the course of the line has been varied one can generally see where the original track passed.



SPECIAL WAGONS BUILT BY THE LONDON AND SOUTH WESTERN RAILWAY FOR CHINA CLAY TRAFFIC FROM WENFORD TO PADSTOW HARBOUR.

Grogley is a favourite place for picnics and for fishing expeditions from Wadebridge, and in view of the fact that one goods train a week generally suffices for the one mile branch to Ruthern, which here diverges, it is not surprising that most of the alighting passengers utilise that route as a highway for some distance. The weekly goods train reaches the branch *viâ* a siding. It is understood that in the old days it was not unusual to keep passengers waiting at Grogley, while the engine travelled up the branch and back again, to deliver or collect such traffic as there was.

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Nanstallon halt almost aspires to a station, but as in the case of other "halts" on the line, is not served by the Great Western motor-trains on the route. It has the distant signals for Boscarne Junction, where the Great Western route diverges to their station at Bodmin. At the Junction tablets or staffs are exchanged, and each route has a siding, but there is no provision for crossing trains. Just beyond the Junction is Dunmere halt, whence the 6½ miles to Wenford Bridge diverges.

This branch is only used for goods traffic, almost entirely of china clay from St. Breward, and is of peculiar interest, though unfortunately time would not permit of the writer going over it. However, the china clay traffic of St. Breward receives attention in a separate article, and for the present it will be sufficient to mention that the line is of light construction and is exceptionally sinuous. It is said that only twice on the journey could the driver see his brake van, until recent improvements were undertaken, while the scenic beauty of the route is almost unsurpassed.

From Dunmere halt is an unbroken run to Bodmin, where a neat station in the older portion of the town has replaced the original premises. At the end of the platform some of the old buildings can still be identified. Bodmin is a busy market town, and the administrative centre for the district. The administration offices, barracks and asylum are located near the South Western station. There is consequently a good deal of county traffic, while military movements are by no means a small factor. The town is an interesting one in many ways and on the whole provides Mr. Fishley, the South Western stationmaster, with a fair amount of traffic to supervise. In the ordinary way a rail motor car works the branch, including one or two trips through to Padstow and back, but on market days, holidays and special occasions a train is necessary, and with anything like considerable loads the severe grades (1 in 40 in places) and sharp curves of the line impose a heavy strain on the engines employed.

It may be mentioned that three of the old Beattie 2-4-0 tank engines are still kept at Wadebridge for working the Wenford Bridge line, and these, believed to be the last survivors of a once-famous class, also take a share in supplementary traffic and local goods between Bodmin, Wadebridge and Padstow.

(To be continued.)

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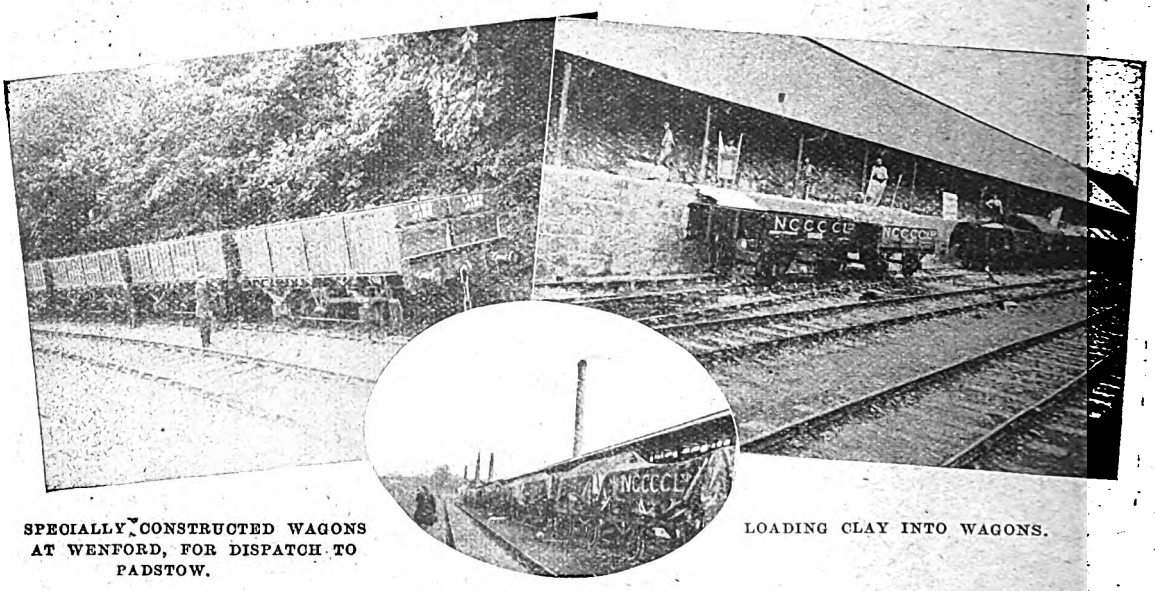
China Clay in Cornwall and Devon.

WHEREVER one travels by rail in Devon and Cornwall the subject of china clay is continually arising, whether it be along the Great Western line, where at Lostwithiel, Par and Fowey it is a very big factor, calling for special provision on the part of the railway company, or further north at Bodmin, Wadebridge and Padstow, or in Devonshire at Torrington, Bideford and Fremington, one comes across indications of the importance of this traffic. One source is the Marsland deposit served by the North Devon China Clay Co., whose railway runs from Torrington to Marsland; but the biggest factor is the work of the North Cornwall China Clay Co., Ltd., of St. Breward, on Stannon Moor.

The Stannon Moor deposit is not only the most extensive in Cornwall, but ranks as the largest in the world. For such materials as china clay, ten acres would be considered a large area, and in one case a 10 acre area has been worked for many years by four companies. But the Stannon Moor deposit has been tested and found uniform over 200 acres, and it is believed that its area is nearer 400 acres, and its depth probably 300 or 400 ft. It is situated at the foot of Rough Tor, the highest hill but one (Brown Willie) in Cornwall, and the ground on the opposite side of the moor rises to a considerable height.



SPECIALLY CONSTRUCTED WAGONS AT WENFORD, FOR DISPATCH TO PADSTOW.

LOADING CLAY INTO WAGONS.

TRAIN OF SHEETED WAGONS LEAVING WENFORD.

As the subject is not very generally known, some particulars of the methods adopted and equipment will be of interest. The clay is detached by hydrants, or by cascades into which surface water is directed, so that it is washed down into sand boxes or drags, where the sand is deposited while the clay is carried off with the water in suspension.

When the drag is full it is dug out, whilst an adjoining drag, or box, is being filled. This waste sand is loaded into little trolley wagons that run on rails. These are drawn by wire ropes to the high surface tips which are such a peculiar feature of many Cornish

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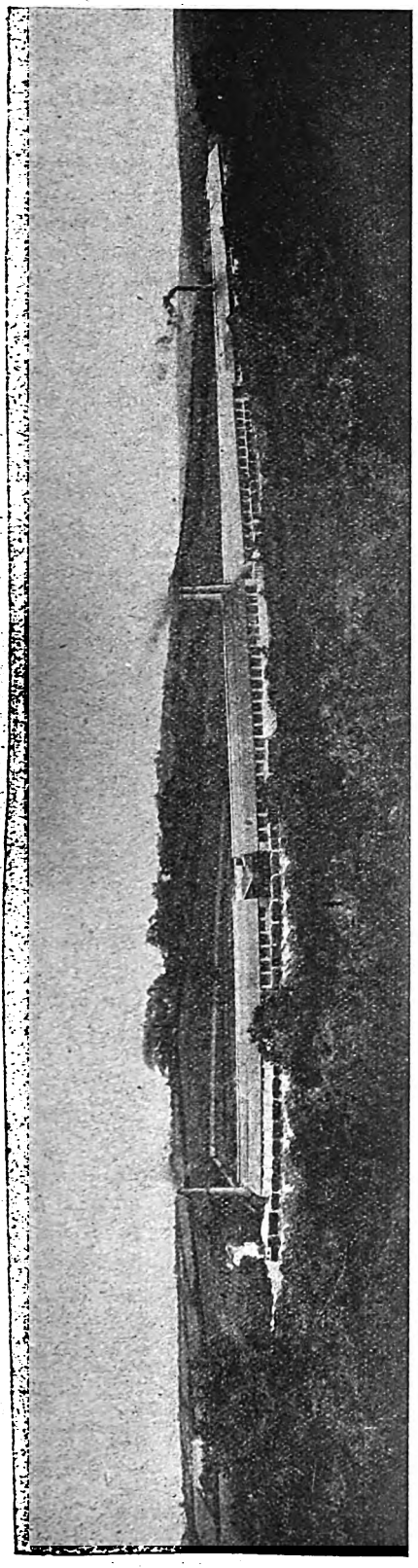

RANGE OF SIX KILNS, AND VIEW OF TRAIN AT WENFORD.
The kilns and plant of the North Cornwall China Clay Co., Ltd., at Wenford extend for about a mile.

landscapes. The milky-looking clay-water flows away into a great well or sump, leaving the solid matter, 75 per cent. of which is composed of quartz sand, with a little mica. The 25 per cent. remaining is clay with mica, held in suspension by the water. The mica is got rid of later.

The milky water is now pumped from the wells or sumps by powerful engines and water wheels to the surface. It then flows along a series of channels called "micas." At the inlet of the first of the "micas" the water passes through a copper gauze, the holes in which are 250 to the sq. in. At the end of the course another copper gauze is stretched with no fewer than 1,000 holes to the sq. in., through which the purified clay water flows to the settling pits. This gauze retains all remaining impurities. This series of open channels is increased in area, hence the rate of flow decreases. The fine grains of mica carried in suspension at the higher rate of flow settle to the bottom of the channels, where they are retained by traps, which are periodically cleaned. From the settling pits the clay is subjected to further purifying processes, and then with only sufficient water to make it fluid is conveyed by earthenware conduits to the kilns at Wenford Bridge, five miles from the pits. Here the branch of the Bodmin and Wadebridge line gives access to the London and South Western Railway, while other connections lead to the Bodmin branch of the Great Western Railway.

The kilns are built on the requisite levels to the tanks, in order to conveniently receive the plastic clay. Under the floors of the "drys," as the kilns are termed, are a series of flues from the furnace at one end right through to the chimney at the other end. When the partially dried clay has had the remaining water driven off, the dry cake is stored in the Linhay—a long lean-to or covered platform, parallel with the railway siding.

The chief shipping ports are Fowey and Padstow, thus giving access to both the South and North Coasts of Cornwall. Shipments are also made from Plymouth, Par and Wadebridge. The Company's shipping office is at Fowey, where vessels with a tonnage from 150 up to 8,000 load simultaneously.

At Fowey the Great Western Railway has provided special conveyor and elevator equipment for dealing with this traffic, while the accommodation at Padstow has already received attention. Special container trucks are employed by the London and South Western Railway between Wenford Bridge and Padstow.

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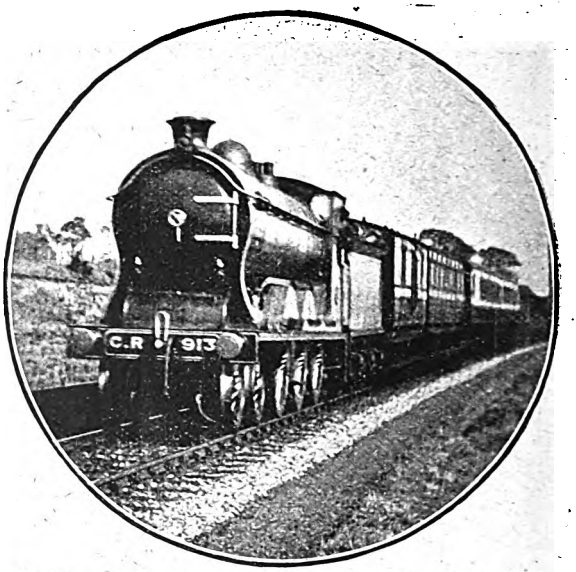
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Tom M. L. Neish.*

CALEDONIAN RAILWAY.
Dundee–Glasgow train, hauled by 4–6–0 engine No. 913 (5 ft. 9 in. class).

IN last month's article there appeared these words, "We shall need to be prepared for even further curtailments"—of train services—"before the opening year has proceeded far on its course." This sentence served as introduction to a review of the principal modifications of our express train services that had taken place between the commencement of the War and the time of writing, *i.e.*, the latter end of November. But I little thought that this forecast would have its fulfilment only a few days after the lines were in print, and in a manner more drastic than could have been conceived. Considerable and far-reaching though the alterations hitherto made have been, they are comparatively trifling as compared with the veritable "combing out" that will have taken place in our time-tables some weeks before this number is in the hands of the reader. I understand that the Editor is dealing with the main features of the train service alterations and modifications, and must reserve my own comments on the changes for the March issue.

It would be impossible to question the wisdom of these changes. To those of us who have been compelled to travel for business purposes it must have been evident that there was far more travel either for pleasure or for other insufficient reasons than present circumstances justify, the aggregate number of people patronising the long-distance trains being probably greater even than in peace time. Nothing short of such drastic measures could have provided the wholesome corrective that was necessary, but it is comforting to reflect that, the more drastic they are made, the more rapidly will be helped forward that happy consummation when something resembling the travel conditions of pre-war times will be restored to us. Meanwhile, one cannot at present gauge the immediate effect of the changes on locomotive work. Greater loads than ever will probably become the order of the day, on such fast trains as still remain, and the interest of performance from this standpoint will therefore be increased, even at the expense of a necessary reduction of average speed. It is hardly possible, indeed, to conceive of such running conditions existing in this country as would leave the observer of locomotive performance with "nothing to report."

One more noteworthy locomotive development must be added to our review of "practice" in 1916, and that is the very handsome new 4–4–0 type that has just made its appearance on the Highland Railway, the first design of Mr. C. Cumming, recently appointed locomotive superintendent. The most interesting feature of these powerful engines is the reversion to outside cylinders, in conjunction with Walschaert valve motion, and the use of a Belpaire firebox, which is new to Highland Railway practice. Cylinders are 20 in. diameter by 26 in. stroke, with inside admission piston valves, coupled

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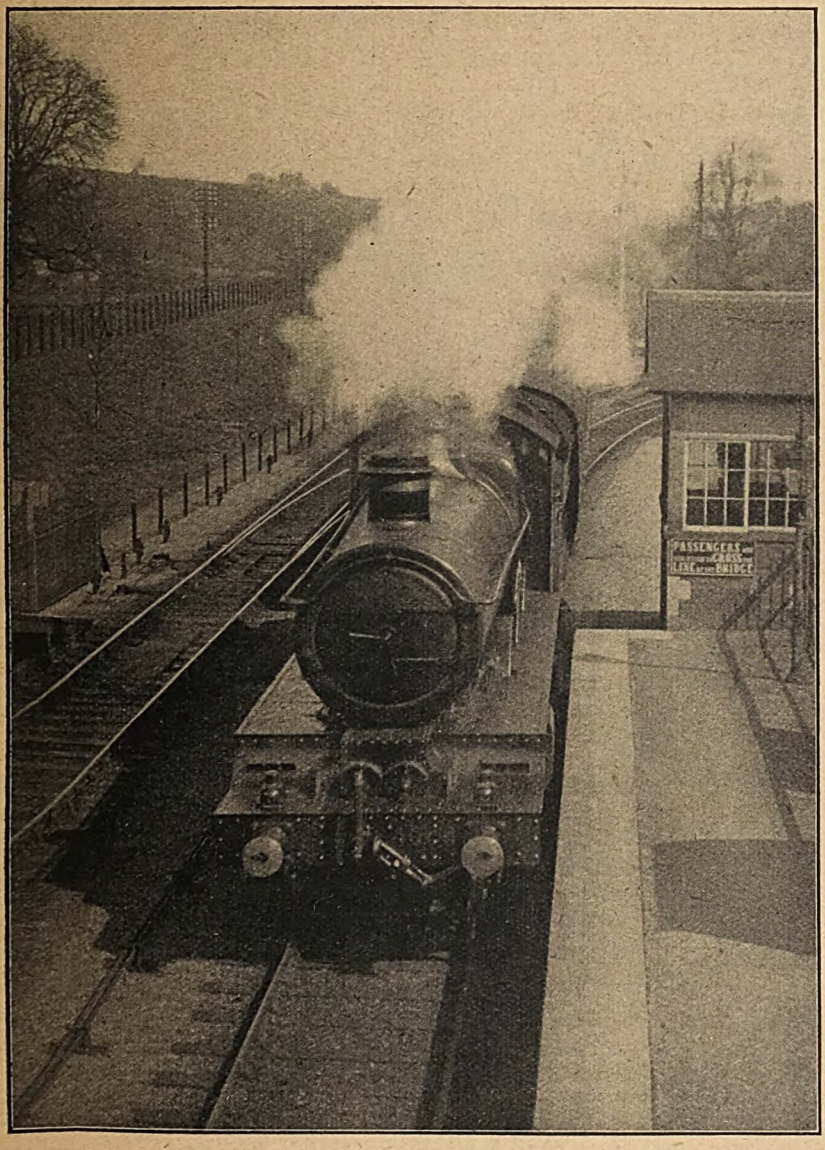

Photo] [*Raymond Walker.*

GREAT WESTERN RAILWAY.

11.5 a.m. express *ex*-Paddington passing Bathampton. 4–6–0 four-cylinder engine No. 4044, *Prince George.*

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wheels are 6 ft. 3 in. diameter, and working pressure is 160 lb. per sq. in. Further dimensions are not yet available. These engines, of which two are at present in use, are intended principally for working passenger trains between Inverness and Wick—a route which has sprung into considerable importance during the past two years.

Another interesting event has been the building by Mr. J. A. Hookham, Locomotive Superintendent of the North Staffordshire Railway, of a new 0–6–4 express tank locomotive, No. 53, similar in general dimensions to the late Mr. J. H. Adams' tank engines of the same wheel arrangement, but having 5 ft. 6 in. instead of 5 ft. driving wheels. A little over a year ago I wrote to the latter gentleman, enquiring whether he had tried the 5 ft. 0–6–4 engine No. 31 on the 12.10 p.m. from Manchester to Stoke (a run with which was described in the last issue), as it might naturally be considered that the small wheels and ample adhesion weight would prove of material assistance, especially in recovering from Cheadle Hulme slack up the long ascent to Macclesfield, and also in starting from Macclesfield up to the Moss Box without banking assistance. But he replied that he thought the 5 ft. wheels too small in view of the mile-a-minute rate required between Macclesfield and Stoke. As the new engine is designated an "express" tank, however, it would appear that the experiment is about to be tried, and No. 53 should be able to acquit herself well, even with the heaviest loads, on the severe grades of the North Staffordshire line.

In making use in the last paragraph but one of the expression "further dimensions are not available," I am reminded of a communication recently received from a reader in India, who writes: "What *are* the principal dimensions of a locomotive engine? Every month dozens of locomotives are described and illustrated in the technical press, and in each case the principal dimensions are given, presumably for the purpose of comparison"—rather, I should imagine, for statistical record than for comparison—"but how often the respective details differ to such an extent as makes direct comparison impossible. Now the tractive capacity of a locomotive depends on three factors—adhesion, tractive force and boiler power. It would therefore appear that the essential dimensions required to indicate that capacity are:—adhesion weight, cylinder diameter and stroke, driving wheel diameter, boiler pressure, heating surface, superheating surface, grate area, and perhaps total weight in working order. Yet how often boiler pressure, say, or grate area are omitted, while total weight or total length of engine and tender are included, neither of which has any real bearing on the case."

"When fuller dimensions are given they should, I think, be sufficient to give a general conception of the design and proportions of the machine. In this connection I should like to point out the ambiguity of certain dimensions. This is particularly true of boiler diameter. In the case of a telescopic boiler constructed in three rings of $\frac{5}{8}$ in. plate, the difference between the minimum internal and the maximum external diameter is one of $3\frac{3}{4}$ in. If a definite point of measurement were selected; there would be no doubt of the meaning of, say, a 5 ft. 6 in. boiler."

Although use of such expressions as "mean diameter," or even of an unqualified "diameter" in connection with boilers is not uncommon, and is, as my friend points out, valueless for purposes of comparison, I think he will more generally find this dimension qualified as, say, "internal diameter of largest ring," or "external diameter of smallest ring," and so on. At the same time, it is the very lack of uniformity in these things that lays present practice the more open to objection.

"Superheating surface," the writer continues, "is sometimes added to heating surface, and sometimes given separately. The latter would appear to be the correct method, but the universal adoption of either would be satisfactory." In consideration, also, of the relatively large percentage of the total steam production that is generated in the firebox, it is no less important that firebox heating surface should be separated from boiler heating surface. Were boiler, firebox, and superheating surfaces given separately, it is an easy matter to add them together in order to arrive at an estimate of aggregate heating surface. "Again, in calculating tractive force," the letter goes on, "the adoption of a universal percentage of working pressure would make direct comparison possible. At present, in order to be sure of the relative figures for locomotives of different railways, one has to work them out on a common standard for oneself, which is undeniably tedious."

"To save space, the dimensions which seem to me necessary in forming a general conception of a locomotive are given diagrammatically." (This diagram I have redrawn and it is reproduced on page 110.) "The

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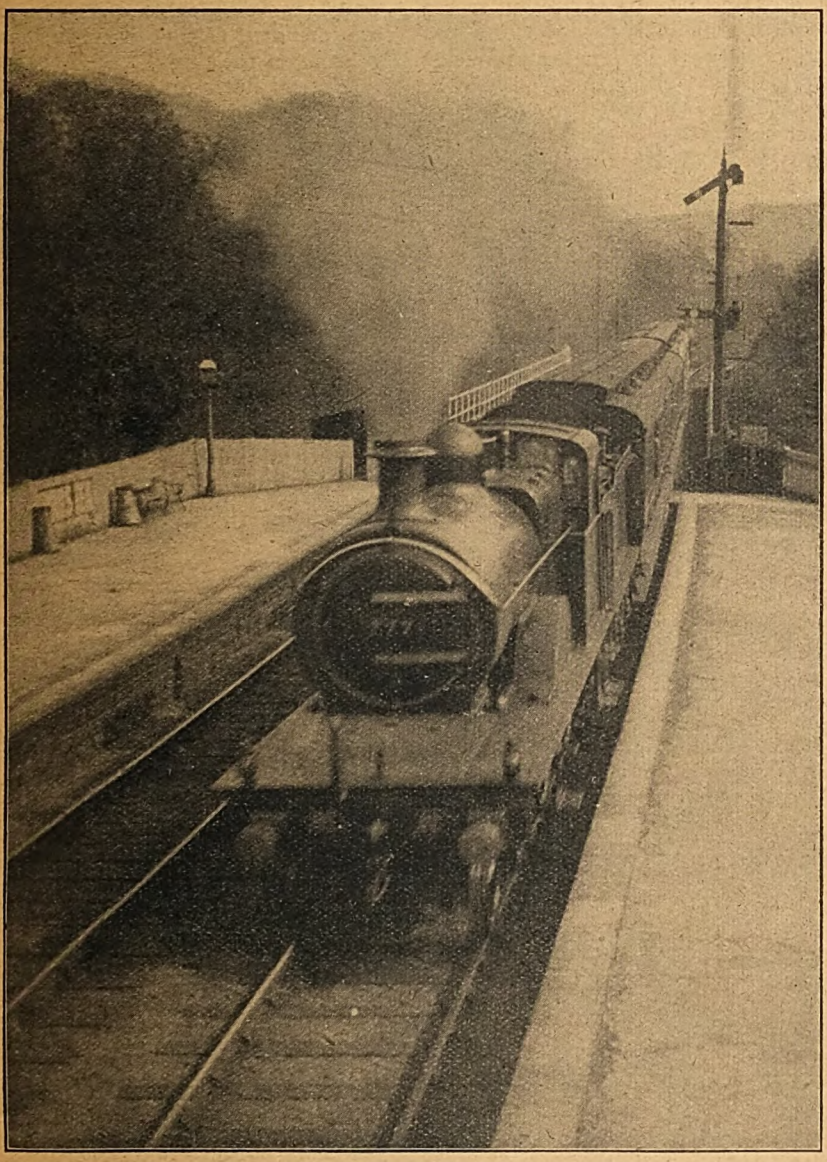

Photo] *[Raymond Walker.*

MIDLAND RAILWAY.

London–Manchester express passing Cromford. 4–4–0 locomotive No. 777.

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distance from the centre of the driving axle to the front of the firebox casing is given as the simplest method of establishing the relative positions of the boiler and the wheelbase. The depth of the firebox is of such vital importance to the steaming capacity of the engine that it seems well worth inclusion. Where a wide box is used, the width might also be given. The heights of the boiler centre and to the top of the chimney are essential, particularly in judging from a photograph; as an example, one may cite the alteration in appearance of Wainwright's 4–4–0's on the South Eastern and Chatham Railway, after being fitted with a shorter chimney. In conclusion, I am, of course, aware that the different locomotive departments are responsible for the dimensions given, but the subject is one I have never seen discussed."

From bitter experience—of hunting through sheaves of technical literature in frenzied search for "missing" figures—I am entirely at one with my correspondent as to the desirability of "standardised" dimensions. Probably a smaller list than this would satisfy most of those who are interested in the subject, provided that the information given were always uniform in character. The most important dimensions, I think it would be agreed, are diameter and stroke of cylinders, diameter of driving wheels, heating surface of firebox, tubes and superheater, grate area, working pressure, adhesion weight and total weight of engine in working order, which together enable a fairly comprehensive estimate of the steaming and tractive capacity of the engine to be obtained, and are, in fact, necessary to that end. Such additional dimensions as my friend cites are of lesser importance from this standpoint, although they allow the external features of the engine to be visualised, while at the same time furnishing useful information as to the main features of its design. There is certainly much to be said for a "standardisation" of the published particulars relating to new locomotives.

A correspondent's query has been passed on to me by the Editor as to which is the heaviest 4–4–0 express locomotive type at present running in the British Isles. So far as I am able to trace, the honour in question belongs to the large 6 ft. 4–4–0 engines of Mr. Drummond's design on the Glasgow and South Western Railway; these locomotives weigh 61·9 tons in working order, of which 39·9 tons rest on the driving wheels. I believe the more recent superheater batch of those engines weigh nearly 2 tons heavier even than this, but exact figures have not yet been made public. Next come Mr. Robinson's "Directors" on the Great Central Railway, weighing 61 tons, of which 39·6 tons are adhesive. Following are Mr. Bowen Cooke's "George the Fifth" class of the London and North Western Railway, totalling 59·9 tons, with 38·3 tons on the coupled wheels, and the "Precursors," 59·8 and 38· tons respectively. The Midland Deeley compounds also weigh 59·8 tons, carrying 39·1 tons on the drivers. Next the North Eastern Railway claims recognition in Mr. Wilson Worsdell's R1 class, which weigh 59·5 tons each, of which the record proportion (for this country) of 42 tons rests on the two coupled axles. These engines have now been superheated, but I do not know whether the weight has thereby been varied to any extent.

After this we have the large 4–4–0 of Mr. Maunsell's design on the Great Southern and Western Railway of Ireland—*Sir William Goulding*—weighing 59·4 tons, of which 37·5 are available for adhesion, the 59·2-ton Urie rebuilt London and South Western 463 class engines, with 37·6 tons adhesion weight, and the 59-ton Caledonian 120 type superheaters, with 38 tons adhesive. Mr. Pickersgill's latest 4–4–0's on that line may be heavier than this, but their weights have not yet been published. Closely following the foregoing are the Great Western "Counties" (58·8 tons), the Midland 999's (58·5 tons), the South Eastern and Chatham Railway enlarged 4–4–0's (57·5 tons), and the North British Railway superheater 4–4–0's (57·3 tons). All the foregoing weights are, of course, of engine alone, irrespective of the tender weights. There are, thus, quite a number of 4–4–0 engines running in this country approximating in weight to 60 tons, of which nearly two-thirds is available for adhesion. In fact, the development of this useful wheel arrangement in these islands has been quite astonishing, and the varied and onerous work with which these engines are entrusted has no parallel the world over.

In connection with the London and South Western runs which appeared in the issue of last December, I have a correction to make, which is best done by quoting from the letter of a Chatham correspondent on the subject. "According to the log on page 393 of the November issue," he writes, "No. 565 is put down as covering the 10 miles from Micheldever to Basingstoke in 7 min., thus giving

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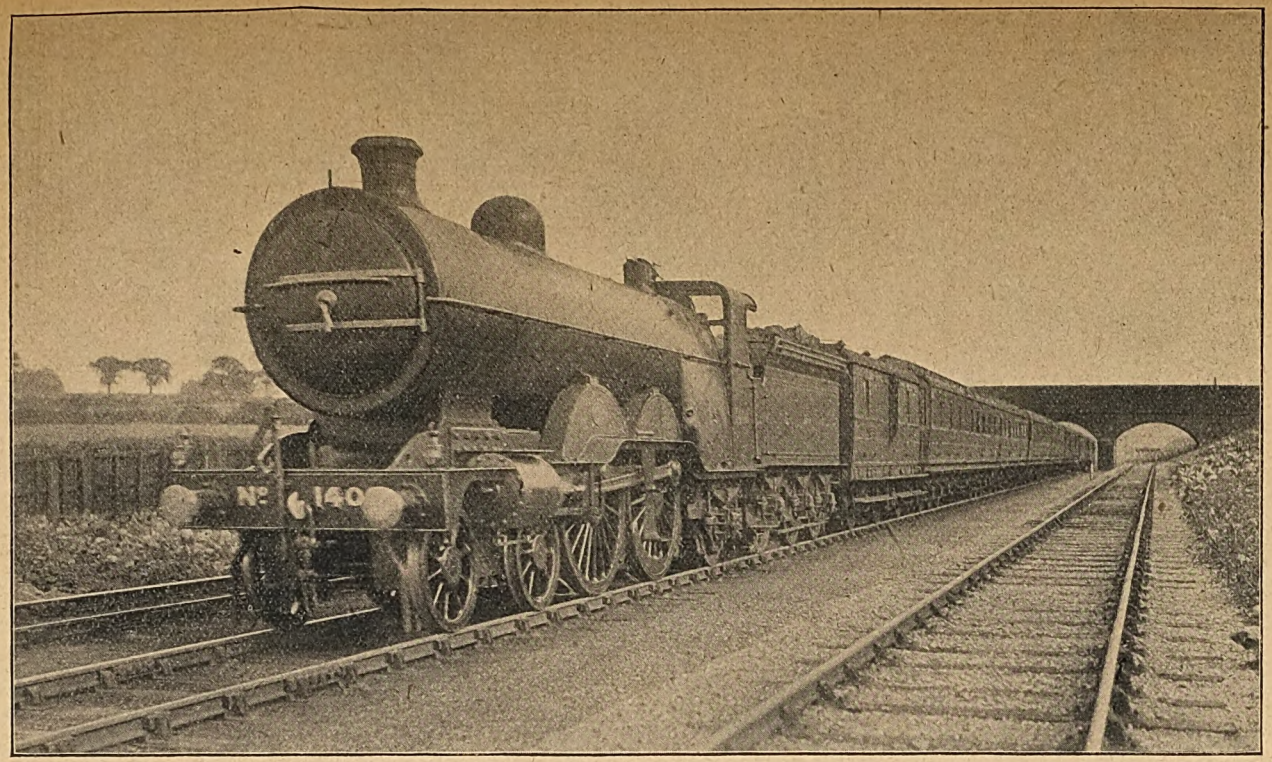

Photo] *[H. T. Worlock.*

GREAT NORTHERN RAILWAY.

Down Cromer express near Potters Bar. 4–4–2 engine No. 1408.

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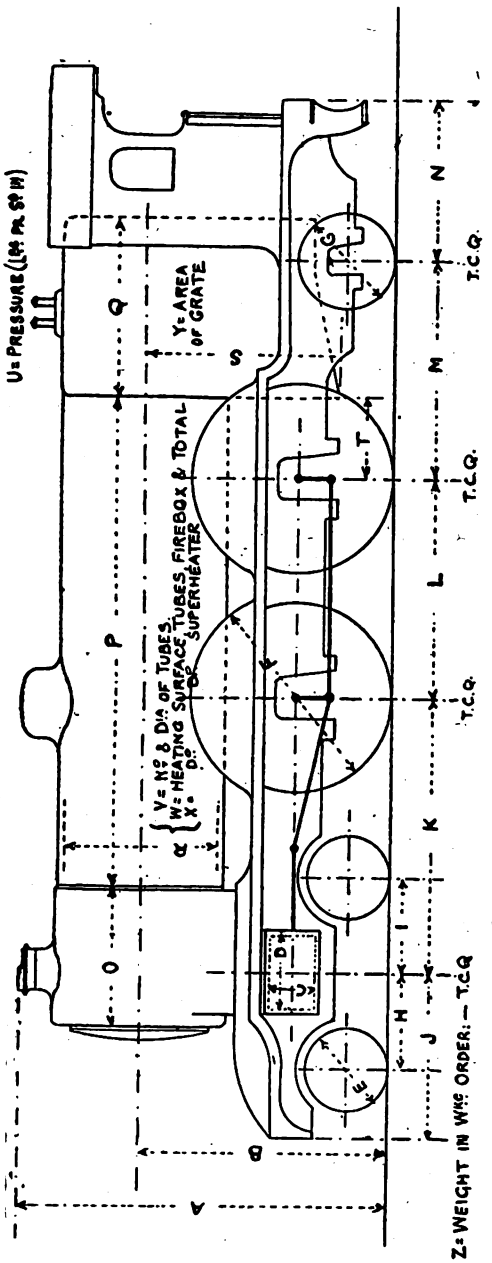
U= PRESSURE (LBS. PER SQ. IN.)
Y= AREA OF GRATE
V= No. & DIA. OF TUBES
W= HEATING SURFACE TUBES, FIREBOX & TOTAL
X= SUPERHEATER
Z= WEIGHT IN WKG ORDER. — T.C.Q.
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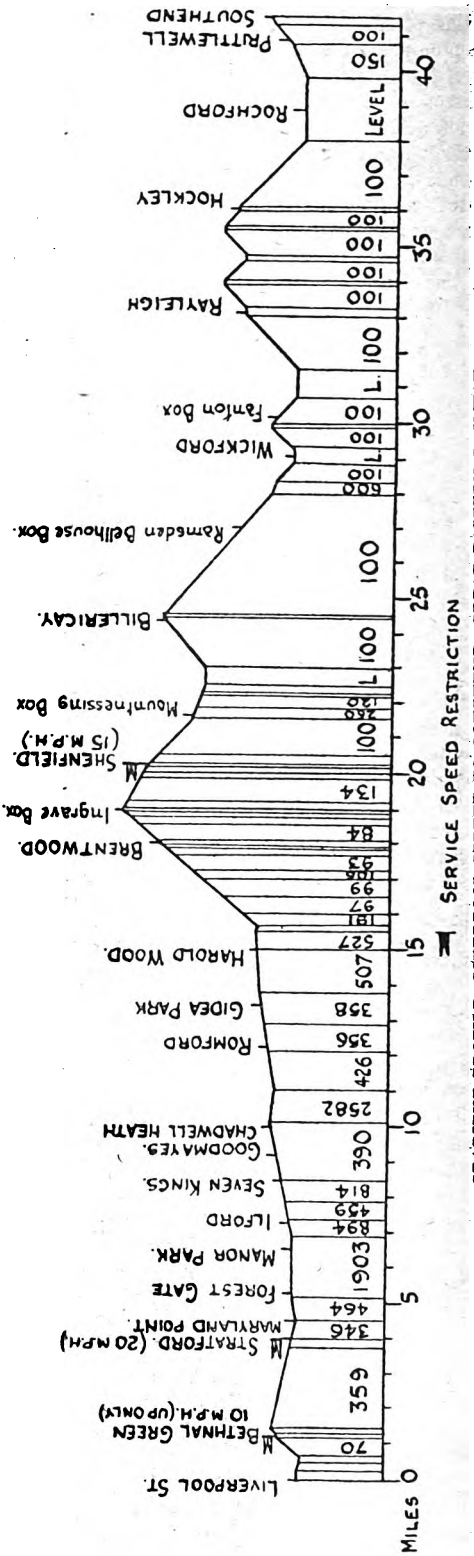
DIAGRAM SETTING FORTH RELATION OF PRINCIPAL LOCOMOTIVE DIMENSIONS.



GRADIENT PROFILE, LIVERPOOL STREET TO SOUTHEND, GREAT EASTERN RAILWAY.

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a time of 45¼ min. to the latter from Southampton. I should imagine this was a printer's error for 55 min. 15 sec." This is obviously correct, although I am not sure that I can saddle the printer with the responsibility! "But on a recent journey by the 7.30 p.m. (Sunday) train from Southampton," the letter continues, "we *did* get through Basingstoke in 45 min., and this is easily the best time I have had among a series of runs on this train. Here is the log :—

Miles.			M. S.
0·0	..	Southampton ..	0.0
5·7	..	Eastleigh ..	9.50
12·6	..	Winchester ..	19.18
21·1	..	Micheldever ..	32.37
31·4	..	Basingstoke ..	44.52
39·4	..	Winchfield ..	51.50
46·0	..	Farnborough ..	58.06
54·9	..	Woking	66.09
60·1	..	Weybridge ..	71.29
sigs. very severe. Surbiton and Clapham.			
77·9	..	Vauxhall ..	99.57

"The engine was one of the rebuilt superheater 4–6–0's, No. 443, and the load fourteen 8-wheelers, mostly corridor, and including dining car, or, say, 400 tons. If it had not been for the vexatious check at Surbiton, when the train was all but brought to a stand, and for another bad one at Clapham Junction, I imagine we should have reached Vauxhall in 91½ min.—½ min. gain on schedule—which with this load seems to me very creditable." This last allowance appears to me too modest, as, in my experience, with a continued maintenance of the high speed involved in covering the 28·7 miles from Basingstoke to Weybridge in 26 min. 37 sec., the engine would not have had the slightest difficulty in covering the 17·8 miles on to Vauxhall stop in 18½ min., making a total time of 90 min. In any case this must have been an excellent piece of work, both as regards the continued rate of 37·5 miles per hour up the long ascent past Winchester, and the substantial rate maintained beyond Basingstoke. Superheating, indeed, seems to have revolutionised the performance of these engines, although I do not doubt that the economy in the consumption of water is in part responsible, by relieving the drivers of any anxiety on this score on the longer non-stop journeys.

I have now to redeem my promise to give details of some runs on the Southend service of the Great Eastern Railway, which always provides some interesting material for observations. As the difficulty of the Great Eastern Railway route is perhaps imperfectly realised, I am appending herewith a profile of the gradients, those between Shenfield and Southend not having being published previously, so far as my memory serves. From this it will be seen that down trains have to face the 3 miles at 1 in 84–97 of Brentwood bank; then, when nicely getting into speed again after Ingrave, there comes a 15 m.p.h. speed reduction over the junction at Shenfield, while there are subsequent rises at 1 in 100 of 1½ miles to Billericay, and 2½ miles past Rayleigh, with other short bits at the same inclination, including an awkward start from Prittlewell. To these hindrances must be added the 1 in 70 rise up to Bethnal Green, near the start, and the slack through Stratford, in addition to almost inevitable delays in the neighbourhood of that busy centre. On the up journey the start from Prittlewell (where all trains stop) is a favourable one, but after that there is some real collar-work to face, beginning with Hockley bank, of 2⅓ miles at 1 in 100, and continuing later with the severe ascent from Wickford to Billericay, 4¼ miles long, of which fully 3⅞ miles are inclined at 1 in 100. Shenfield slack comes in the middle of another uphill stretch of 3 miles, 2½ of which are at 1 in 100–134, but from Ingrave to Stratford there is a fine "racing-ground" of 15 miles, continuously favourable, before the congested suburban area, with its bad slacks at Stratford and Bethnal Green, is entered. Seeing that the Great Eastern route is 6 miles longer than that of the rival company, the times scheduled (at the time of writing I cannot say whether these are to be increased) are very enterprising, and it is not surprising that they were calculated for a limit load of 36 axles, amounting at most to a tare load of about 240 tons.

The first four runs (page 115) were on the down tea-car express, and of them the first and third were described among my "best" runs of 1915 in the January issue of last year. In both cases these were severe delays from the preceding 5.2 p.m. out of Liverpool Street, which shunts at Brentwood, so that Shenfield was passed behind time, but on each of these runs such good work was done on the branch that the 20·7 miles from Shenfield to Prittlewell were reeled off in 21¾ min. On the first journey we touched 64 m.p.h. at Mountnessing, and only fell to 50 at Billericay, but went very cautiously down Ramsden bank, not exceeding 64 m.p.h. The lowest speed on Rayleigh bank was 52 m.p.h., but we passed Rochford at 77½—hitherto my highest record on the Great Eastern Railway—and thus reached Prittlewell only 10 sec. late. Although the arrears on the third

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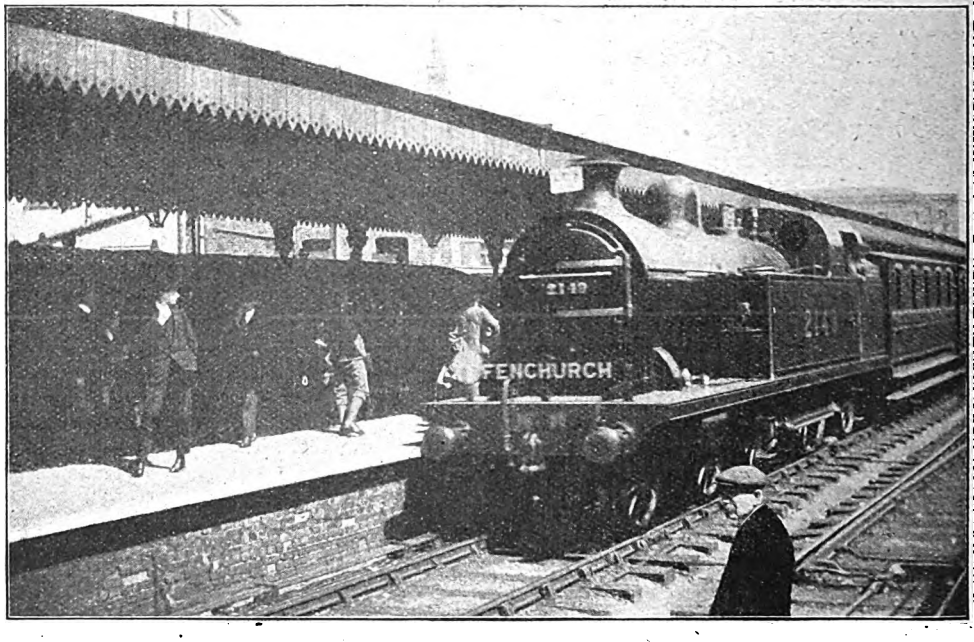
journey were too great to regain, a gallant effort was made; the speeds at Mountnessing and Billericay respectively were 61 and 45½ m.p.h., after which we went down to Wickford at a steady 75. At Rayleigh we fell to 41 m.p.h., and we did not exceed 74 at Rochford, thus arriving 2 min. late. But to gain 2¼ min. on these fast branch timings is no mean achievement. The second run was a somewhat uninteresting journey with no delays, save a slight one at Bow Junction, and the driver, after gaining over 1¼ min. on the easy schedule out to Shenfield, proceeded to lose them again on the branch, although arriving practically dead on time. enterprising, the driver of No. 1795 contriving to lose 2 min. 20 sec. to Shenfield without delays of any sort, by unaccountably poor running up Brentwood bank. With so light a load beyond Shenfield, also, the work done might have been decidedly improved as, even allowing for the two checks, both of which were but moderate, barely one minute of the arrears was regained. We touched 59 m.p.h. at Mountnessing, fell to 42 at Billericay, and reached maxima of 71½ at Ramsden and 70 at Rochford. The first run on the 8.2 p.m. down was notable as giving the fastest time I have ever yet recorded through Romford, speed rising to



Photo] [*C. Cowshall.*

MIDLAND RAILWAY (L.T. & S. SECTION).
Train entering Fenchurch Street station. Large 4-4-2 tank engine No. 2149.

On the fourth run the same delay was experienced as on the first and third, but no attempt was made to recover the arrears beyond Shenfield, the running between there and Prittlewell being decidedly poor, under the circumstances, especially as regards the minima of 41 m.p.h. at Billericay and 37 at Rayleigh. The top speeds at Ramsden and Rochford were 72½ and 70 m.p.h. respectively, while a decided slackening of speed was made through Wickford.

Three other runs are tabulated on trains calling at Shenfield, those on the 8.2 p.m. down including a stop also at Brentwood. That on the 6.5 p.m. down was anything but 56 m.p.h. at Chadwell Heath, but serious delays ensued at Brentwood Bank and Yard Boxes. Very fair running was made beyond Shenfield, however, speed rising to 64 m.p.h. at Mountnessing, and, after an intervening minimum of 49 at Billericay, to 71½ at Ramsden. But the rate was moderated to 60 through Wickford, while the slight permanent way check beyond Fanton caused us to drop to 39 at Rayleigh, the final speed at Rochford being 70 m.p.h. So our net time from Shenfield to Prittlewell was about 22½ min. No. 1795 figured again in the last down run, which was undistinguished; the highest speeds were 72½ m.p.h. at Ramsden and 69

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at Rochford, while the lowest were 43½ at Billericay and 41 at Rayleigh. The fastest running on the branch that I have seen recorded was made in the early days of the accelerated service, and reached me from a friend; the load was similar to those above-mentioned—15 axles, or 105 tons—and the engine No. 1847. Billericay was passed in 5 min. 9 sec. from Shenfield, Wickford in 9 min. 5 sec., Rayleigh in 12 min. 58 sec., Hockley in 16 min. 5 sec., Rochford in 18 min. 15 sec., and Prittlewell was reached in 20 min. 57 sec., the highest speeds at Ramsden and Rochford being 75 and 72½ m.p.h. respectively, and the lowest beyond Rayleigh 53 m.p.h. Thus 3 min. was economised on the smart 24 min. booking by a run in all but "even time."

We must now turn to the up runs, which are, on the whole, a great deal more interesting. The first three were made on the up morning breakfast car train, which always carries a substantial load, partly in order to find accommodation for the large contingent of passengers joining at Brentwood. Of these runs the first was sent me by the same correspondent as the run last-mentioned above, and was made by No. 1855 in pre-superheat days, the load consisting of nine corridor 8-wheelers, including two restaurant cars. The lowest rate on Hockley bank was 37½ m.p.h., and the maximum beyond Rayleigh 72½, while a minimum of 33 on Ramsden bank was succeeded by a top speed of 62½ m.p.h. at Mountnessing. With a due observance of Shenfield slack, Brentwood was reached in 14 sec. under the (then) schedule time of 30 min., which has since been increased by a minute. On the second occasion, No. 1866 had to tackle a load well above the regulation 36 axles, but did valiantly. Speed rose to 47 m.p.h. at Rochford, but fell to 32 on Hockley bank; after a maximum of 68 m.p.h. at Rayleigh, however, we ran excellently up Ramsden bank, speed being maintained steadily at 33 m.p.h. to the summit. A final spurt to 62½ m.p.h. at Mountnessing took us through Shenfield on time, and we reached Brentwood with 20 sec. in hand. With an increased load of 280 tons beyond Brentwood, we ran to Liverpool Street in exactly the allotted 26 min., despite a severe signal check at Forest Gate, or in 23¾ min. net, the net running time from Prittlewell to Liverpool Street being 54½ min., against 57 min. booked. On the third occasion, with the same load and engine, we were badly hampered on the branch by a strong wind from the north-west, and so fell to 31 m.p.h. at Hockley and 32 at Billericay, while not exceeding 67 beyond Rayleigh and 62 at Mountnessing. A slight signal check before Shenfield made us take 50 sec. overtime to Brentwood, but the net loss did not exceed ¼ min. From Brentwood, however, we ran in to town, despite a slight signal check at Gidea Park, in 24 min. 35 sec., or 24 min. net, the total net running time from Prittlewell in this case being 55¼ min., and the arrival at Liverpool Street fractionally before time.

Some of the short journeys, next tabulated, on the 7.25 p.m. up were quite interesting. This train hurries in the "crack" up schedule to Shenfield, and then, as if repenting of such needless haste, continues in a particularly leisurely fashion to the terminus, being often subject also to considerable delays at the latter end of its course. So it is not, perhaps, surprising, in view of the easy timing that follows, when such an undistinguished run as that of No. 1798 is made, the aggregate loss of 4 min.—2 min. net loss—not being very creditable. As against this, No. 1805 did particularly well. Attaining 50 m.p.h. at Rochford, we went up Hockley bank without the speed falling below 38½ m.p.h., and then touched 74—my record at this point in the up journey—beyond Rayleigh. Passing Wickford at 69 m.p.h., we dropped on Ramsden bank to a steady 42 m.p.h. until near the summit, when, apparently through a premature notching up, the rate fell quickly to 36 m.p.h. But, by the aid of a maximum of 65 at Mountnessing, we reached Shenfield in the good time of 25½ min. It is interesting to compare the times of this run with those of the first of the 8.15 a.m. series, from which they at no point diverge by more than 15 sec. The next run to me was the most interesting, in that I had not previously either seen or heard of one of the large six-coupled engines on the branch, and the considerable increase in tractive power is manifest at every stage in the journey. We were doing 53 m.p.h. at Rochford, and fell to 39 on Hockley bank, but an increase of the speed beyond 65 m.p.h. at Rayleigh was cut short by a bad permanent way check near the foot of the bank, with the result that we passed Wickford at a comparatively low rate of speed. First-class work, however, was done up to Billericay, the rate on the long ascent being maintained unvaringly at 42½ m.p.h., while the unusually high maximum of 68 m.p.h. was touched at Mountnessing. So we practically kept time to

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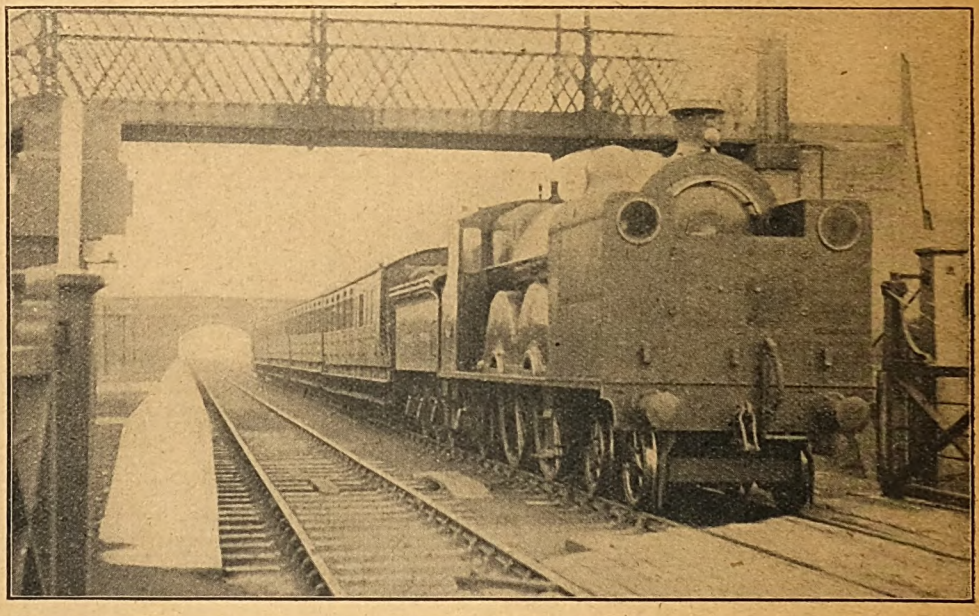
Shenfield, delay included, although the net time was only a fraction over the standard allowance for the much easier down journey between the same points. Of the last journey, on the 3.55 p.m. up (Saturday) tea-car train, but little need be said, as the load was rather too heavy for the engine. But under the circumstances the performance was not bad, the lowest speed being 31 m.p.h. at Hockley and 28 at Billericay, while the highest were 68 at Rayleigh and 60 at Mountnessing. As this train is allowed 27 min. to Shenfield, the engine only dropped 1 min. 25 sec.

By way of comparison, a few runs on the



Photo] [*A. Conville.*

LANCASHIRE AND YORKSHIRE RAILWAY.
4–4–2 engine No. 1398 (fitted with indicator shelter) on train at Huncoat station.

rival Midland route may furnish interesting reading. On the whole, I think they have the easier task, as despite their very congested approach to and exit from the City, the only other material hindrance is the ascent from Horndon on the west and Pitsea on the east to Laindon. The former includes about 3½ miles at 1 in 132–185, while the latter is steeper, averaging from 1 in 110–132 for fully 3 miles westward from Pitsea. A slack is rarely made at Pitsea, although on the outward journey the speed is not usually allowed to exceed about 60 m.p.h. over the junction. Similarly at Barking a slack on the east-bound journey is not customary, although sometimes made, but on the up journey speed is moderated through Barking to between 45 and 50 m.p.h. Owing to the division of the old 5.15 p.m. down into three portions—at 4.57, 5.6 and 5.15 p.m.—these crack trains do not now load very heavily, but some of the later evening trains, booked to reach Southend in the even hour with stops at Stepney or Burdett Road, Leigh and Westcliff, as well as one, or even two, further intermediate stations, such as East Ham or Upminster, have their work cut out to keep time if with the full load of 13 well-filled bogie vehicles. Generally speaking, the up trains are the better time-keepers, apart from delays beyond Gas Factory Junction. Their timing is in most cases slightly easier than on the east-bound journey, while in addition they reap more advantage from the falling grades, which are better distributed and "spread out" without the encumbrance of slacks or the necessity to moderate speed. From Laindon to Barking, for example, is an excellent fast-running stretch, the initial speed attained down to East Horndon carrying the trains well over the slight rise to Upminster, while beyond Hornchurch the grades are as far as Barking mostly in favour of the engines. I should imagine the hardest up trip to work was the 8.4 a.m. from

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GREAT EASTERN RAILWAY: LIVERPOOL STREET–SOUTHEND.

Distance	Train *ex*-Liverpool Street		5.18 p.m.				6.5 p.m.		8.2 p.m.		
	Engine No. (4–4–0)		†1797	†1855	1829	1803		1795		1832	1795
	Load (axles)		33	33	36	32		‖30		‖26	‖29
	„ (tons tare)		203	203	217	191		184		158	172
	„ (tons full)		220	220	240	210		§205		§170	§185
Miles			min.	M.S.	M.S.	M.S.	M.S.	min.	M.S.	min.	M.S.	M.S.
0·0	Liverpool Street	dep.	0	0.00	0.00	0.00	0.00	0	0.00	0	0.00	0.00
					c	c	c					
4·0	Stratford	pass	8	7.55	8.20	8.00	9.00	8	8.10	8	7.05	8.10
						d						
7·3	Ilford	„	—	12.25	12.45	13.00	13.55	—	13.00	—	11.30	13.00
						d						
10·0	Chadwell Heath	„	16	15.20	15.45	17.00	17.00	15	16.15	15	14.20	16.10
				a		d	e					
12·4	Romford	„	—	19.20	18.20	20.30	21.10	—	19.15	—	16.55	19.05
				b		d					h	k
18·2	Brentwood	„	—	30.00	26.00	31.00	31.05	—	28.20	27	30.05	28.05
						d						
20·2	Shenfield	„	31	33.25	29.40	35.20	34.50	31	33.20	5	5.55	5.30
24·4	Billericay	„	—	38.20	35.15	40.15	40.10	—	5.45	—	5.50	5.50
29·0	Wickford	„	—	42.50	40.05	44.35	44.45	—	10.15	10	9.45	10.15
									f		f	
33·1	Rayleigh	„	—	47.15	44.55	48.35	49.45	—	15.10	—	14.30	14.45
									g			
36·1	Hockley	„	—	50.55	49.55	52.25	53.55	—	19.30	—	18.15	18.30
38·7	Rochford	„	—	53.00	52.35	54.45	56.15	—	21.50	—	20.30	20.50
40·9	Prittlewell	arr.	55	55.10	55.05	57.05	58.55	24	24.20	24	23.05	23.25
40·9	Net time (min.)		55	50½	54½	51½	54	55	56½	56	54	56

† Superheater engine; ‖ 15 axles from Shenfield; § 100 tons from Shenfield; a sigs., Crowlands, severe; b Romford advance starter, dead stop; c sigs., Bow Junction; d sig. checks, Manor Park to Ingrave; e sigs., Romford Junction, virtual stop; f slight p.w. check, Tanton; g p.w.r. check, Rayleigh; h sig. stop, Brentwood Bank Box; k sig. slack, Brentwood Bank Box.

Thick horizontal line indicates booked stop.

GREAT EASTERN RAILWAY: SOUTHEND–SHENFIELD AND BRENTWOOD.

Distance	Train *ex*-Southend		8.15 a.m.			7.25 p.m.				¶3.55 p.m.
	Engine, 4–4–0, No.		1855	1866	1866		†1798	1805	*1523	4–4–0
	Load (axles)		36	41	41		30	26	30	42
	„ (tons tare)		237	255	255		185	157	183	245
	„ (tons full)		250	270	270		195	165	195	255
Miles.			min.	M.S.	M.S.	M.S.	min.	M.S.	M.S.	M.S.	M.S.
0·0	Prittlewell	dep.	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
2·2	Rochford	pass	—	3.41	3.55	4.20	—	3.40	3.50	3.30	4.00
4·7	Hockley	„	—	7.03	7.30	7.50	—	7.15	7.10	6.45	7.45
7·8	Rayleigh	„	—	11.04	12.00	12.20	—	11.45	11.05	10.40	12.20
								b		b	
11·9	Wickford	„	—	14.47	15.50	16.15	—	16.40	14.45	15.20	16.20
13·7	Ramsden Box	„	—	—	17.50	18.15	—	19.00	16.35	17.45	18.20
16·5	Billericay	„	—	20.40	22.00	22.35	—	24.40	20.25	21.25	23.10
19·3	Mountnessing Box	„	—	—	25.05	25.30	—	27.50	23.20	24.10	26.25
						a					
20·7	Shenfield	„	27	25.45	26.55	27.55	26	29.55	25.30	26.10	‡28.25
21·6	Ingrave	„	—	—	28.50	30.00					
22·7	Brentwood	arr.	31	29.46	30.40	31.50					
	Net time (min.)		31	29¾	30¾	31¼	26	28	25¼	24¼	‡28½

† Swindon superheater; * 4–6–0 superheater type; ¶ Saturdays only; ‡ schedule 27 min.; a slight signal check, Shenfield; b p.w.r. check, Rayleigh.

Thick horizontal line indicates booked stop.

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Southend, which, although made up to 13 of the new Midland six-a-side stock, and calling at Westcliff, Laindon, Upminster and Stepney, yet completes the journey in the even hour. With all these allowances, however, it would require a very heavy load on the Midland route to compensate for the more severe gradients, and the 6 miles or 17 per cent. increased distance of that worked by the Great Eastern Company.

My experiences of the Midland route have mainly been in the down direction, and on the non-stop trains, seven journeys with which I have tabulated. By far the best run was the first, made in days prior to Midland ownership, when with the maximum load, amounting with passengers to fully 345 tons, and possibly more, we ran to Westcliff in 46 min. 47 sec., or more than 1¼ min. under the present schedule of the non-stop 4.57 p.m. down. The time allowed the 5.5 p.m. express, on which this run was made, was then 45 min. to Westcliff, however. We made the customary slack at Stepney, and also reduced speed at Barking to 40 m.p.h., after which we touched 50 m.p.h. at Dagenham and 60 near East Horndon, falling on the ascent to Laindon to 36 m.p.h. Down Laindon bank we did 60 m.p.h. exactly. Of the second run I have very few details beyond the bare times, but the engine was one of the penultimate 4-4-2 type, and had more difficulty with the load than the rebuilt engine on the first run, dropping 4½ min. on the Westcliff booking then in force. But making allowance for the delay beyond Stepney, the net time was only ½ min. above the present allowance of the 4.57 p.m. train.

The latter express figures in runs 3 and 4, where the load, however, was much lighter than in the early days of two trains only. After the usual chronic delays due to the rebuilding of the Great Eastern Railway viaduct between Stepney and Gas Factory Junction, we got away fairly well on run 3, maintaining 50 m.p.h. from Barking to Dagenham, but were then badly checked by signal at Hornchurch. Regaining speed, we touched 58 m.p.h. at East Horndon, and went up to Laindon with a minimum of 32 m.p.h. The highest rate at Pitsea was 62, and after a short lapse to 53, we covered most of the distance from Benfleet to Leigh at 59–60 m.p.h., the net gain on schedule being 2 min. Against this, No. 4 run, with a non-rebuilt engine, was a poor affair. The starting delays were worse, and in addition to these we slacked to 37 m.p.h. at Barking, not recovering to more than 47 at Dagenham, and falling to 43 at Hornchurch. Further than this, we only touched 56 m.p.h. at Horndon, and fell to 33 at Lainden summit, while the maximum down to Pitsea was a beggarly 56 an hour. The only decent part of the journey was the time from Benfleet to Leigh, and in the end we dropped 3½ min. on schedule, although, allowing for delays, we were really a minute to the good: But it is possible that the generous times now given these non-stop trains (in comparison with the faster bookings in the past, when loads were heavier) make at least some allowance for delays before Bromley. Exception may be taken, by the way, to the generous allowance made for passengers in these logs, but it must be remembered in this connection that these are trains of compartment coaches, each compartment conveying a normal complement of 9 or 10 passengers, which is very different to the average 5 or 6 of a well-filled corridor train.

Run No. 5 was as good a trip as any in the table, and was on the Saturday 12.55 p.m. train. Initial delays were worse than ever, as even when off the Great Eastern metals we were stopped dead by signal at Campbell Road Junction. But then we got away well, touching 48 m.p.h. before Barking, and reaching 52 between there and Dagenham. The lowest rate at Hornchurch was 44½ m.p.h. and the highest at Horndon 58½, while the minimum on the ascent to Laindon was 35 m.p.h. Down to Pitsea we touched 61 m.p.h., and sustained 58½ from Benfleet to Leigh. So our net time was 2¼ min. inside schedule. No. 6 was also a fair run, but with a light load, on the 5.6 p.m. down, the start being less delayed and more brisk than usual, although we slacked to 40 m.p.h. through Barking. Before Dagenham we were doing 50½ m.p.h., and fell to 44½ at Hornchurch, afterwards recovering to 58½ at Horndon. We went up to Laindon with a minimum of 36 m.p.h., and touched 64 before Pitsea, but slacked to 50 through the junction, thereby rather spoiling the finish of the run. Despite that, however, we kept time exactly. The last journey was on the 4.7 p.m. from Fenchurch Street, which still retains its 50 m.p.h. booking from Stepney to Westcliff, but does not, I should imagine, often cover the 33 miles in 39 min. We slacked to 40 m.p.h. at Barking, afterwards attaining 55 before Dagenham; a minimum of 49½ m.p.h. at Hornchurch was then succeeded by a maximum of 61½ at Horndon, after which the lowest rate at Laindon was 37½ m.p.h. A signal check before Leigh

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hampered the conclusion of the run, and we dropped exactly 4 min., 3 of which, however, could properly be credited to delays.

Of the up journey I have but little to say, as my experience of the fast morning trains has been small. But a couple of runs on the up Ealing "corridor" in the evening are worthy of mention. On the first the load was the maximum one of eight cars, weighing 54½ m.p.h., after which the mile-a-minute rate was again reached at Dagenham. Running in easily, we completed the 25·5 miles from Leigh to Barking in 31 min. 10 sec., the intermediate stages of 3·7 miles from Pitsea to Laindon having taken 5 min. 10 sec., the 7·6 miles thence to Upminster 5 min. 40 sec., and the 3·9 miles thence to Dagenham 4 min. 10 sec. Another run, with the same load and No. 2156, not then

MIDLAND RAILWAY: FENCHURCH STREET–SOUTHEND.

Distance.	Run No.	1	2	3	4	5	6	7
	Engine 4–4–2 No.	*48	57	*2147	2154	*2156	2171	*2152
	T—							
	Load (axles)	52	52	40	36	43	32	31
	„ (tons tare)	302	302	225	203	246	180	171
	„ (tons full)	345	345	260	235	285	210	195
Miles.		M.S.	M.S.	M.S.	M.S.	M.S.	M.S.	M.S.
0·0	Fenchurch Street dep.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					c			
1·7	Stepney .. .. pass	4.31	4.29	5.05	6.05	5.20	5.05	5.20
			a	a	a	a d	a	a
3·3	Bromley .. .. „	7.42	8.36	10.05	11.50	14.25	8.55	4.25
7·6	Barking .. .. „	13.42	14.43	15.40	17.50	20.25	14.20	9.55
11·4	Dagenham .. „	18.20	19.30	20.10	22.50	24.55	19.15	14.25
				b				
13·8	Hornchurch .. „	21.23	22.41	23.45	26.00	27.50	22.10	17.15
15·3	Upminster .. „	23.30	24.50	27.05	28.00	29.45	24.05	19.05
19·2	East Horndon .. „	27.56	29.26	31.50	32.20	33.50	28.10	23.05
22·9	Laindon .. .. „	33.00	34.30	37.05	37.35	38.55	33.05	27.50
26·6	Pitsea .. .. „	37.18	39.03	41.30	42.15	43.10	37.10	32.00
29·3	Benfleet .. .. „	40.08	42.00	44.15	45.10	45.50	40.20	34.50
								e
33·1	Leigh .. .. „	44.20	46.40	48.25	49.10	50.00	45.00	39.35
34·7	Westcliff .. arr.	46.47	49.30	50.45	51.35	52.25		43.00
34·7	Net time (min.) ..	46¾	48¼	46	47	45¾	44	†40

a p.w. checks between Stepney and Gas Factory Junction; b severe signal check, Hornchurch; c signal check, Shadwell; d signal stop, Campbell Road Junction; e signal check, Leigh; * rebuilt large-boilered engine; † Stepney to Westcliff.
Thick horizontal line indicates booked stop.

with a generous complement of passengers, many standing, as near to 250 tons as I could estimate. The engine was No. 2154, a large 4–4–2, not rebuilt. Leaving Leigh, we touched 56 m.p.h. before Pitsea, and passed that place, 6·5 miles distant, in 9 min. 40 sec. On the ascent to Laindon we did excellently not to fall below 41 m.p.h., and we then attained and maintained 67 m.p.h. down the subsequent descent. At Upminster we fell to 56 and at Hornchurch to rebuilt, was not so successful. It took us 10 min. 10 sec. to reach Pitsea, 5 min. 35 sec. thence to Laindon, 8 min. 20 sec. from Laindon to Upminster, 4½ min. from there to Upminster, and a total of 33¼ min. to Barking. Speed did not rise above 55½ m.p.h. at Pitsea, 65 at Laindon, and 58 at Dagenham, while it fell to 36 at Laindon and 45 at Upminster. Nevertheless, time was kept, so there are no legitimate grounds for complaint.

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Locomotive and Train Working in the latter part of the 19th Century.

NORTH EASTERN RAILWAY. [No. IV.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 36, *January* RAILWAY MAGAZINE.)

THE Leeds and Ilkley branch, part of which, from Otley to Ilkley, is jointly owned with the Midland, brings the traveller into the beautiful Yorkshire dales of which so many are served by the North Eastern. Although the Otley and Ilkley section is joint, there always appeared in those days to be what one might term a hostile courtesy between the two companies. They competed for the fairly large passenger traffic from Leeds, and woe betided the unwary passenger between Otley and Ilkley who, owning a season ticket issued by one company, ventured to bestow his form inside coaches belonging to the other. One martinet of a local stationmaster was so rabid on this subject, and exercised so much Prussian discipline over the local travelling public, that the latter turned, like the proverbial worm, and retaliated by invariably and purposely getting into the opposite company's trains, from which they refused to be ejected. For three months or so there was a small railway storm in Wharfedale, but finally the companies—or possibly their too zealous servants—capitulated, and peace reigned, except for a mild aftermath in the shape

Photo] [*Locomotive Publishing Co., Ltd.*

NO. 1809 (PREVIOUSLY NO. 496), "WHITBY BOGIE" CLASS, AS REBUILT AND MODIFIED.

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of occasional mutterings from the station-master in question.

The North Eastern share of the Ilkley trains was worked almost entirely by Fletcher's 0–4–4 bogie tank engines, of which four were stationed at the Ilkley joint engine shed. These tank engines showed more homogeneity than most other types of engine on the North Eastern, but, nevertheless, between 1873 and 1883 Mr. Fletcher managed to construct six different sizes of practically nine or ten different designs. There were twelve engines by Neilson in 1873, followed by twenty by Hawthorn in 1875, the two lots being considerably different in outward appearance, but similar as regards the principal dimensions. They had 5 ft. coupled wheels and 16 in. by 22 in. cylinders. The remainder of the type were built by the Company at their own works, of which those at Gateshead had wheels 5 ft., 5 ft. 3 in., and 5 ft. 6 in. A large number of all three classes had 16 in. by 22 in. cylinders, but many of the later ones with both 5 ft. and 5 ft. 6 in. wheels had 17 in. by 22 in. cylinders. A considerable number were also constructed at Darlington, where not only did they follow some of the Gateshead dimensions, but they also introduced a variant of their own with 5 ft. 8 in. wheels. The Darlington engines not only had their own characteristics and usual marks of origin, which made them differ in many respects from their Gateshead sisters, but both lots differed completely from the previous Neilson and Hawthorn engines, which, as I have previously remarked, bore no outward likeness to one another. Finally, York shops in 1884 collected the fragments of two more of the class which were handed over from Gateshead Works, and naturally the resulting two engines, Nos. 290 and 305, came out with a style of their own—a sort of second cousin once removed resemblance to their Gateshead relatives. The tank engines of this type were ubiquitous on the North Eastern in all divisions; and as may be seen from the illustrations, the tanks were at the back over the bogies. Those at Ilkley were No. 957 and at one time No. 10, but after about 1880 Nos. 62, 65, 276 and 1461 were there for a great many years. A similar engine, No. 1000, was shown at the Stephenson Newcastle centenary of 1881, and then put to work at Bradford on the Harrogate service. A large number have since been rebuilt as 0–6–0 side tanks, and many others are now being used for steam autocars.

The branch line up Nidderdale from Harrogate to Pateley Bridge would not require special mention except for the two small tender passenger engines which worked it between 1876 and 1880. These were the queerest specimens amongst the many that the North Eastern possessed. They were numbered 62 and 65, and were the predecessors of the two bogie tank engines at Ilkley which afterwards bore these numbers. They carried a long cast iron date plate on the framing denoting their origin from the works of Kitson, Thompson & Hewitson, of Leeds, but the date had been wisely omitted. The height of the centre of the boiler from the rails was such that the top of the boiler reached up to the level of the waist of a person standing on Harrogate platform, from which, by craning his neck over the top, the observer could see the springs and the tops of the splashers on the opposite side of the engine. They had very tall domes, and were 2–4–0 tender engines with double frames and outside cranks, the latter having a very long "throw." But their principal claim to notoriety lay in the possession of the most ear-piercing and blood-curdling whistles that probably ever adorned a British locomotive. The engines were diminutive Davids as regards size, but the Goliath shriek which they emitted could wake every echo in the Nidderdale glens for miles. However, it is an ill whistle that blows nobody any good, and therefore even that of No. 65 had its secular uses. For the natives of "Paatley Brig" were accustomed to emigrate into Harrogate on Saturdays for a weekly jaunt and also for marketing purposes, and a few revellers would finish the day by spending half an hour before "train time" in quenching their thirsts at the hotel near the railway station. Consequently, it sometimes happened that the last train would depart on its homeward journey minus a few of its regular customers, who wended a disconsolate way home with a midnight tramp of some 12 or 13 miles. An agreement appears to have been struck up with the engine crew, who also belonged to Pateley Bridge, that five minutes before the last train was due to start, No. 65 had to emit its well-known shriek, and as there was no other engine in the country that could emulate or even approach it, the belated rearguard always knew when it was time to quit the bar parlour. But when Nos. 62 and 65 were laid to their rest, sometime about 1880, and No. 372, with an ordinary deep-toned North Eastern whistle, was sent down from Leeds to replace them, there was great tribulation.

The city of Bradford is not on the North

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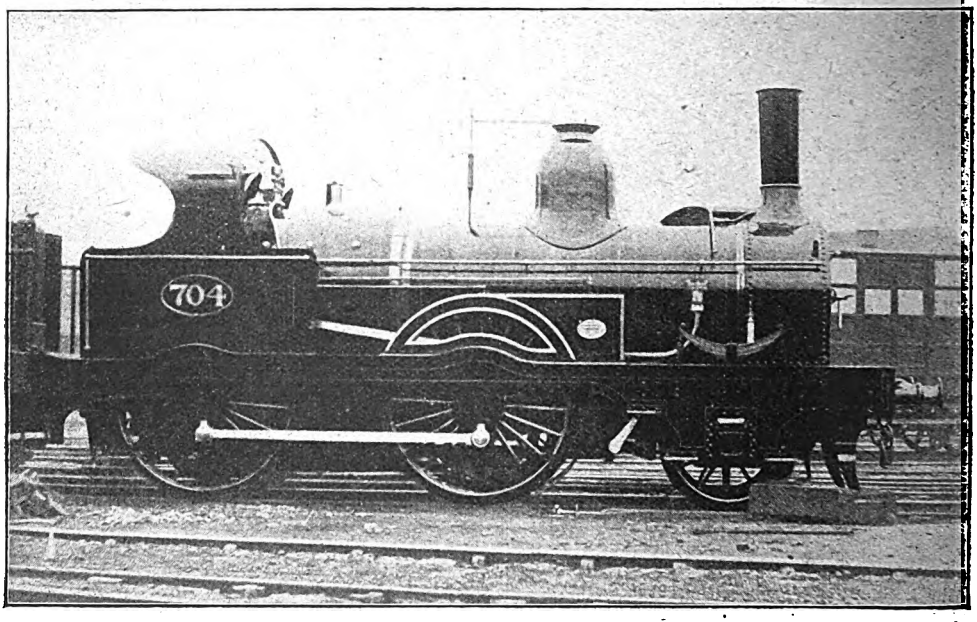
Eastern metals, and until 1878 it was necessary for a Bradfordian to go either to Holbeck or to Leeds before he could find a North Eastern train. But in that year the Midland opened a direct line from Shipley to Guiseley in order to shorten their Bradford–Ilkley line, and the North Eastern took advantage of this new road by invading Bradford *viâ* Otley, and instituted a service of four daily trains in each direction from Harrogate. This service has since grown into ten fast trains in each direction, and many Bradford merchants live at Harrogate (25 miles). The journey from Bradford to Darlington, Newcastle, etc., was also very materially shortened thereby, for the old practice of changing at Holbeck was a constant source of delay to both Midland and North Eastern trains. For a considerable number of years after the inception of this service it was worked by the Fletcher 0–4–4 tank engines, Nos. 1431, 1437, and 1438, built by Messrs. Hawthorn, exactly the same in appearance as No. 1346, illustrated on the next page.

For some 15 to 20 years the Bradford service was entirely in the hands of various classes of Fletcher's bogie tank engines, one of which was stabled at the Midland shed at Manningham. As the service grew, tender engines of all classes began to be used in addition to the tank engines. Some of these were Fletcher 5 ft. 6 in. engines—465 class—which had been rebuilt by Mr. Worsdell. And for a long time the 6 ft. 6 in. rebuilt single engine No. 280 was quartered at Manningham for the Harrogate trains. Considering its small size and power, this old engine did very good work with trains of about six and seven 6-wheeled coaches, but why it was put on to this road I do not understand, for the line abounds in banks of 1 in 60 and 1 in 88 on the Midland portion between Shipley and Milnerwood Junction, where it joins the joint line near Otley. When the "roundabout" system of working became usual, a rebuilt Fletcher 7 ft., No. 849, was stationed at Manningham for a long time and ran daily to Hull *viâ* Harrogate, as explained in a previous portion of this article.



2–4–0 ENGINE NO. 704 (SERIES 698–705).
Built by R. Stephenson & Co., Ltd., 1870. Coupled wheels, 6 ft. diam. Cylinders, 16 in. by 22 in. Nos. 698 and 699 had polished brass domes.

But the North Eastern also invaded Bradford from Leeds, using the Midland main line for the purpose. At first, in 1882, and for nearly 20 years afterwards, this route was used only for excursion and special trains from Hull, York and Scarborough, and the arrangement was probably made owing to the necessity for a Westinghouse fitted engine, which the Midland did not

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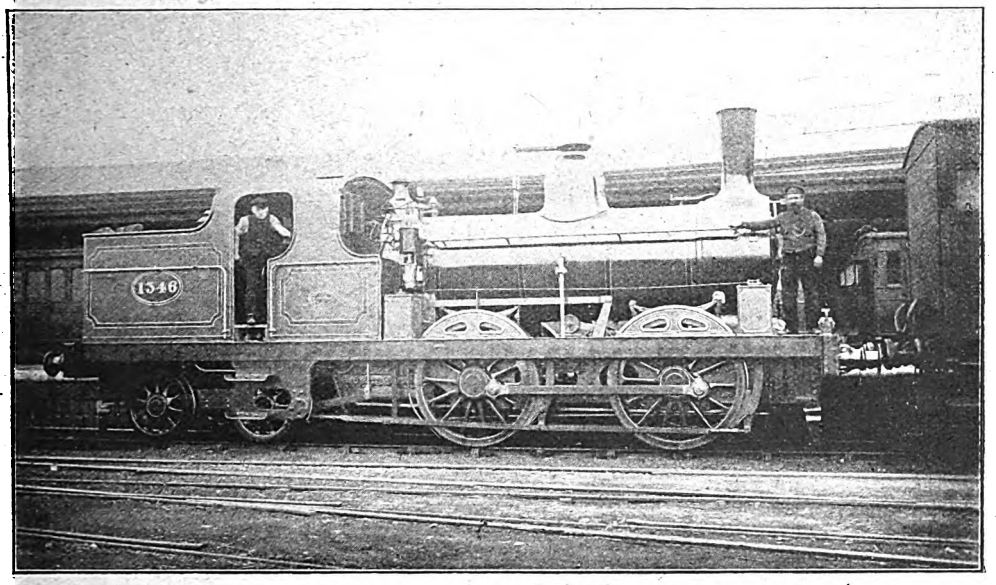

Photo] [*Locomotive Publishing Co., Ltd.*

FLETCHER BOGIE TANK ENGINE NO. 1346 (R. & W. HAWTHORN, 1875).
Coupled wheels, 5 ft. diam. Cylinders, 16 in. by 22 in. This engine was employed on the Harrogate and Pilmoor branch.

supply. But now there are a few regular North Eastern expresses between Bradford and Hull and also in the summer between Bradford and Scarborough. These run direct into the North Eastern station at Leeds, and are the fast special expresses which make the non-stop runs between Leeds and Scarborough. The Scarborough engines run through to Bradford.

Whilst on the subject of these services, it may be of interest to add something as to the somewhat complicated running powers exercised by the North Eastern over other Companies lines and *vice versa*, nearly all of which date from 1878, with the exception of the ancient working of the Great Northern into York. After the North Eastern had got into Bradford, the Midland obtained access to York in 1880 over the Swinton and Knottingley joint line and promptly proceeded to make themselves at home there by stabling a dozen of their engines at that city. From 1883 they began to run excursion trains to Harrogate, and in 1889, when the Midland line from Skipton to Ilkley was opened, they gave the North Eastern running powers to Bolton Abbey, whilst they themselves started a regular passenger service from Colne to Harrogate *viâ* Ilkley and Otley.

Between 1883 and 1888 the Midland also ran a service of trains between Milford Junction and Hull, to connect with the service from York to Sheffield, and stationed three Midland engines in Hull shed for the purpose. In 1888 this service was discontinued, but many years afterwards, when the Hull and Barnsley started a through service of fast trains from Hull to Sheffield (Midland) *viâ* Cudworth, the North Eastern thought it was about time to do something and to utilise their share of the Swinton and Knottingley joint line, which had hitherto been almost entirely in the hands of the Midland. They therefore started a competitive service of expresses worked by North Eastern engines and carriages through to Sheffield (Midland). Finally, in 1903, the Midland started through London trains from Harrogate by using the North Eastern line from Holbeck.

The Lancashire and Yorkshire was the next line in 1885 to take a bite out of the North Eastern cherry, and invaded York from Normanton. I shall deal with these trains, and also with the later service to Hull, in my articles on the Lancashire and Yorkshire Railway, so that it is unnecessary to add anything further. The Lancashire and Yorkshire also started in 1902 a Liverpool–Harrogate service *viâ* Leeds, and worked their own engines and trains from Leeds (Central) to Harrogate.

Strictly speaking, however, priority should

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be given to the Great Central Railway, which, as the former Manchester, Sheffield and Lincolnshire, has since the early 'seventies run through Liverpool and Hull expresses *viâ* Doncaster and Goole. This Company now also utilises the Swinton and Knottingley joint line, since the opening of the Great Central Railway extension to London in 1899, in order to get to York.

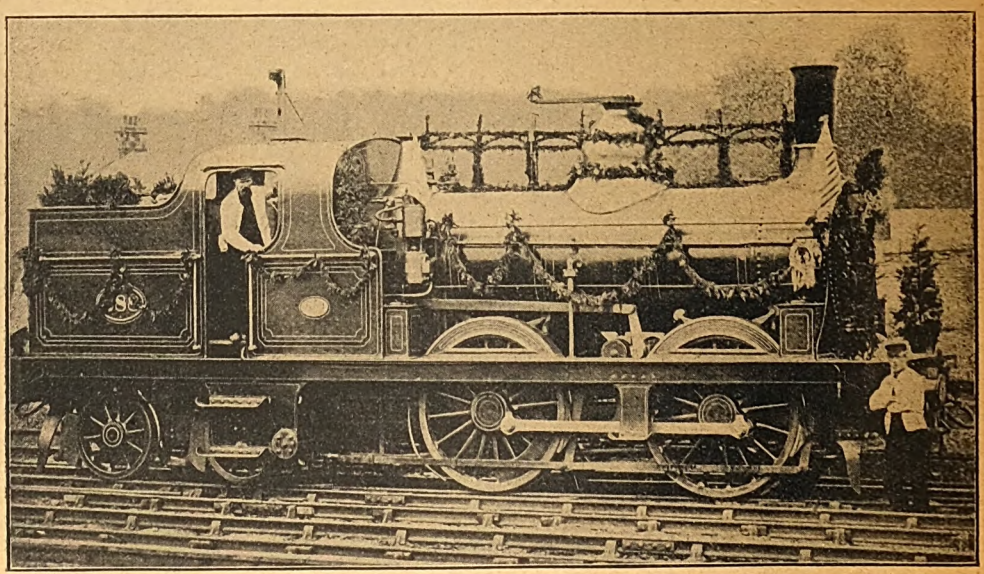
The Great Northern has extended its operations in North Eastern territory by running between Church Fenton, Harrogate and Ripon, one East Coast Scotch express now taking this route in the summer, in addition to a regular London service to and from Harrogate and Ripon. For this purpose they stable two or three passenger engines in the North Eastern shed at Starbeck, where the Midland also secures accommodation for an engine.

The London and North Western also runs its own services of through trains between Leeds and York (the London and North Western Railway engines do not now run through to York, however) and Leeds and Hull. At one time, on one day in the week, the North Eastern ran a through market train from Hull to Manchester (Exchange) and back with its own engines and coaches.

Finally, the Great Eastern thought it was time for them also to take a hand in the plunder, and they continued their Doncaster service from Liverpool Street through to York by utilising the North Eastern line through Selby.

The North Eastern engines are now sometimes to be seen far from their native heath. There is a considerable emigrant traffic between Hull and Liverpool which is taken right through by North Eastern stock by various routes, the Midland (Dore and Chinley), the Great Central *viâ* Sheffield and Godley, and the London and North Western Railway *viâ* Manchester. And occasionally North Eastern engines may be seen at King's Cross with football specials.

After this digression, which brings me down to a considerably later period, I return to the North Eastern road from Leeds to the North, over which certain trains were worked by engines not stabled at Leeds. Between 1876 and 1880 the Saltburn engines to be described shortly, worked one train to Leeds, arriving there at about 10 a.m., and returning at about 2.0 p.m. This train was afterwards handed over to the West Hartlepool engines, Nos. 1266, 1269 and 1162, which worked it for many years. These were 2–4–0 Darlington built engines with 7 ft. wheels, and 17 in. by 26 in. cylinders, the frames being inside throughout. Originally they had been 4–4–0 engines with outside cylinders, and afterwards were completely reconstructed. Of course, they were all different, or they would not have been North Eastern engines. No. 1162 was in reality a



FLETCHER 0–4–4 TANK ENGINE NO. 288, DECORATED FOR THE STEPHENSON CENTENARY.
Coupled wheels, 5 ft. 6 in. diam. Cylinders, 17 in. by 22 in.
Built at Gateshead, 1881.

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new engine in 1880, but possessed the 7 ft. coupled wheels which had belonged to the old Stockton and Darlington engine *Saltburn**. In addition to the three regular engines mentioned, two Beyer Peacock locomotives, Nos. 690 and 697, and a Gateshead double-framed 6 ft. 6 in. 2–4–0, No. 369, also ran as occasional substitutes from West Hartlepool to Leeds, though these usually worked northwards to Newcastle.

The central division of the North Eastern railway had its headquarters at Darlington, and consisted principally of the old Stockton and Darlington line and extensions. This line ran from east to west, crossing the Leeds Northern at Eaglescliffe Junction, and the North Eastern main line at Darlington. The passenger trains started from Saltburn and passed through Darlington. From this point the old main line went to Shildon and Bishop Auckland, but what I may term the later Castle, over Stainmoor to Kirkby Stephen, and the London and North Western (Lancaster and Carlisle) Junction at Tebay. The trains were not particularly exhilarating as regards speed, and possibly on this account, and also because of the climb over the North Yorkshire summit at Stainmoor (1,369 ft. above sea level and the highest railway summit in England), near the borders of Westmoreland, many of the engines employed had driving wheels of the large diameter of 7 ft. Mr. William Bouch, the Locomotive Engineer of the Stockton and Darlington, was responsible for these, and not Mr. Fletcher.

The ten engines in question, Nos. 1238 to 1241 and 1265 to 1270, built at Darlington Works, were known as "Ginx's Babies." I do not know who Ginx or Jinks was; except in lending his name to this particular class of engine, he does not otherwise appear in the recorded annals of the locomotive engine.

* The original *Saltburn* is illustrated in Colburn's well-known work on "Locomotive Engineering."

These engines had leading bogies, outside cylinders 17 in. diameter, with the long stroke of 30 in., and piston valves. The latter were not of the modern form with collapsible segmental rings, introduced 15 years later on the North Eastern by Mr. Smith, and, consequently, they had the great disadvantage of trapping condensed steam in the cylinders to the great detriment of the cylinder covers. The coupled wheels were 7 ft. in diameter. For some years Ginx's Babies perambulated between Saltburn, Darlington and Tebay, and also took charge of the one Saltburn turn to Leeds. But between 1879 and 1882 they were completely reconstructed at Darlington with inside cylinders 17 in. by 26 in. The bogies were removed and single leading wheels with inside bearings substituted. The piston valves also disappeared, but I believe the original 1872–4 boilers and certainly the 7 ft. wheels were used again. The latter had balance weights on the bosses instead of in the rims. Nos. 1266 and 1269 were sent to West Hartlepool to run to Leeds, but the others continued on their old road, except that the Saltburn men had one turn to York and back in place of their former Leeds turn.

In 1894 Nos. 1265 and 1270 were rebuilt with 18 in. by 24 in. cylinders and outside bearings to the leading wheels, and were then closely assimilated to the rebuilt Fletcher 7 ft. coupled engines. The others followed suit in 1901, and then several of them were transferred to Bridlington to run fast trains over the new Market Weighton line to Leeds. Nos. 1240 and 1270 remained at Saltburn for many years. After this rebuild there can hardly have been anything belonging to the original engines left.

It may be added that all Darlington built engines were collectively known all over the line as "Quakers," from the association of the old Stockton and Darlington Railway with some of the leading Quaker families of the district.

(*To be continued.*)

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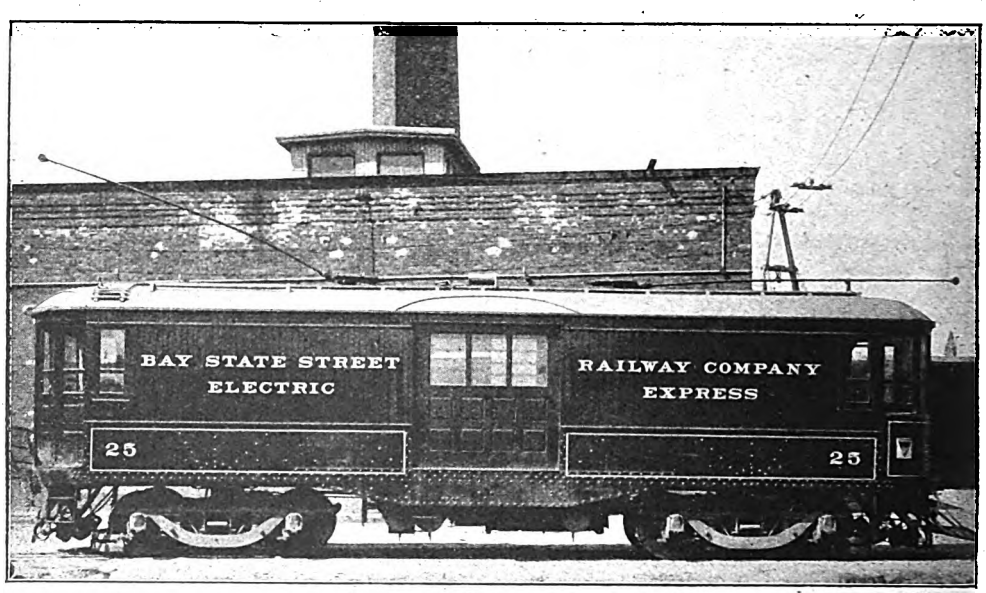

"EXPRESS" AND BAGGAGE MOTOR CAR.

Railway Electrical Progress and Practice.

THE BAY STATE STREET RAILWAY.

[*A feature of travel in the United States of America is the work by the street railways and similar lines. Some of these are direct equivalents to our tramways, but there are many which are more of light railway character, or may be regarded as electric railways of even a more advanced grade, approximating to the conditions of main railway operation. We are indebted to Mr. R. W. A. Salter for the following account of one of the more remarkable lines of the latter class.*—Ed. R.M.]

TRAFFIC conditions in the United States of America have necessitated the introduction of a type of high-speed inter-urban electric railway which is almost unknown in this country. These combine the characteristics usual to an American street railway, or, as we should term it, tramway, with the traffic incidental to more or less comprehensive local train services, sometimes for considerable distances. In addition to the transportation of passengers between different points, freight is handled.

These systems co-operate in many ways with the steam railways, serving as local collecting and distributing agencies; and in a large number of cases the inter-urban lines themselves work in close co-operation, operating in common and maintaining similar and associated tariffs and regulations. Several institutions, among which the Central Electric and American Electric Associations stand prominent, are endeavouring to encourage standardisation on such railways, and much has already been accomplished in this direction.

Most of these inter-urban systems are electric and worked on the overhead trolley system. They benefit in that they are able to deliver direct at the door of the consignee, or *vice versa*. Most of the lines are wholly upon the public highways: in towns they are usually laid in the centre of the street, and in suburban districts on one side. Siding accommodation for two or three cars is frequently provided at each highway crossing, or, perhaps, at intervals of one mile, so that ordinary road traffic is not impeded.

The system operated by the Bay State Street Railway Company, of Boston, Mass., is one of the largest, and comprises 954·7 miles of standard gauge track in the New England states. Its importance may be appreciated from the fact that the system serves, with few competing lines, a district having a total tributary population of 1,500,000, apart from the inhabitants of the City of Boston itself. Boston, one of the

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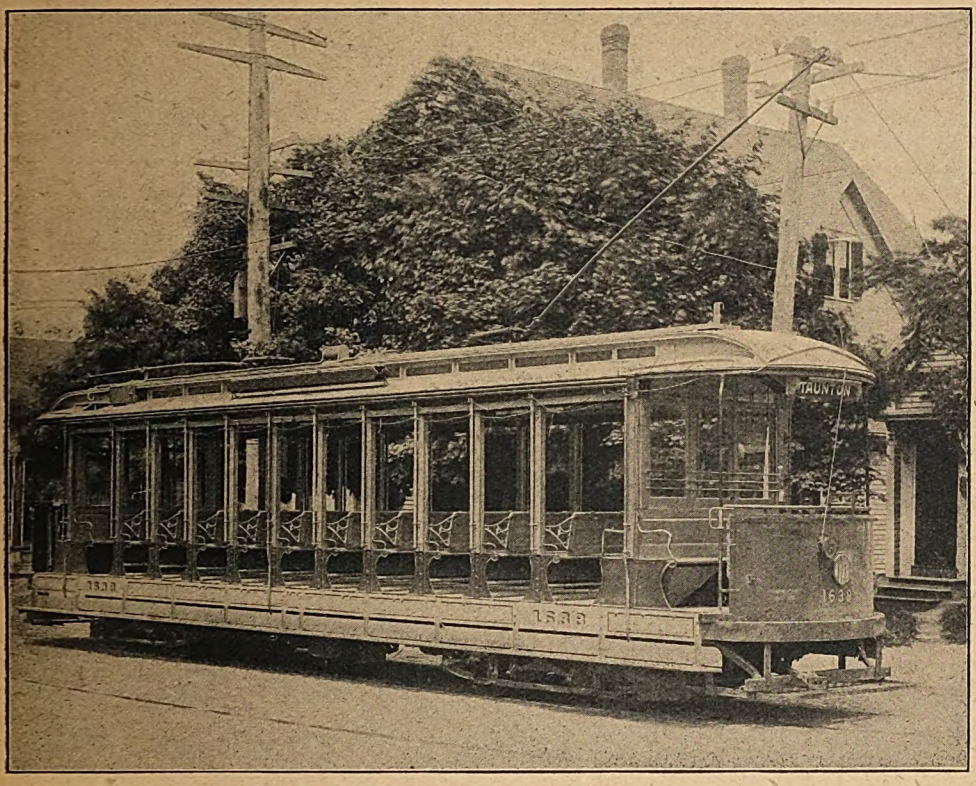

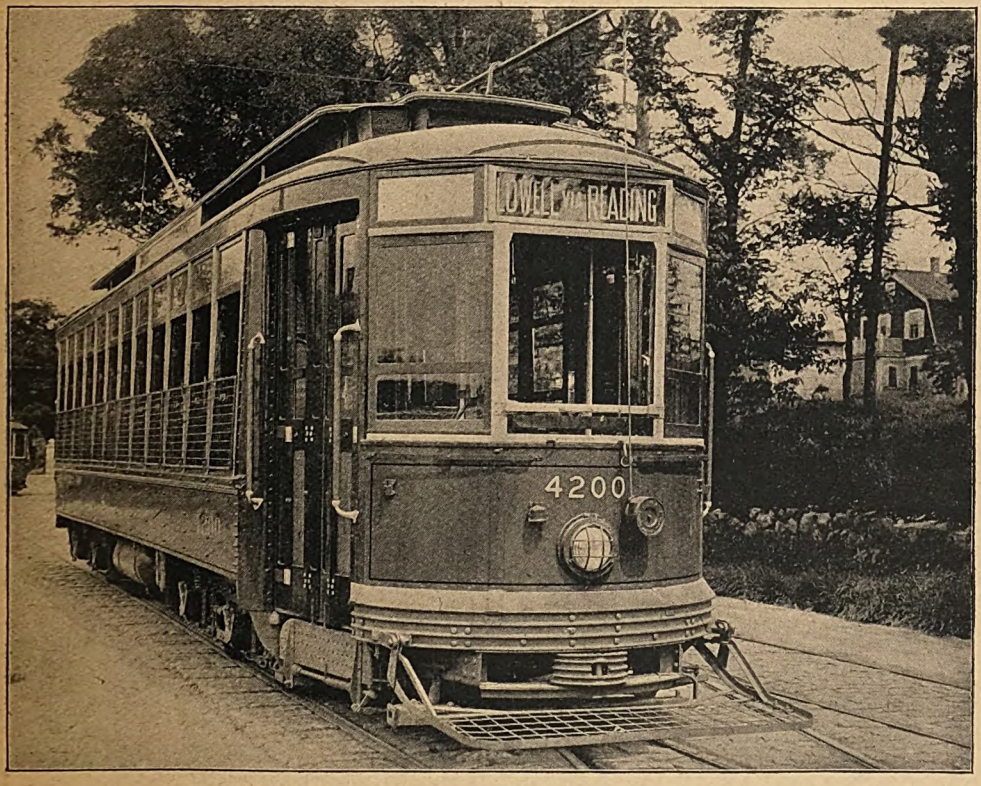

SEMI-OPEN AND ORDINARY CAR.

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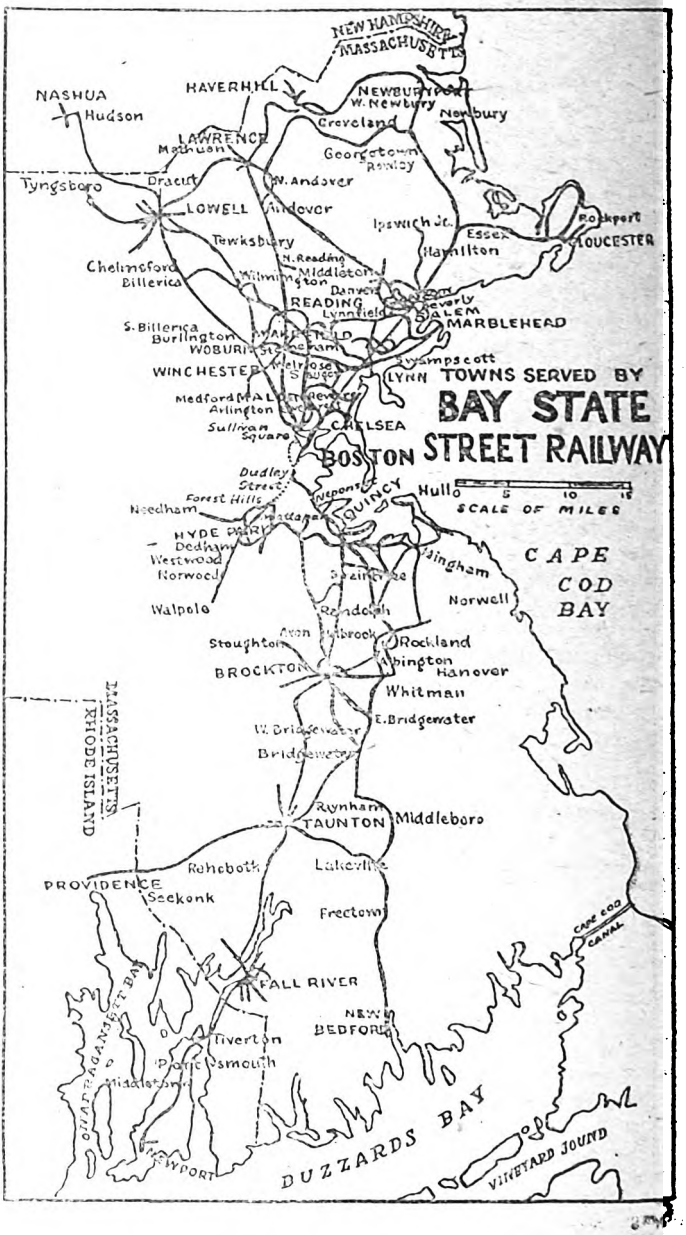
largest and most important cities in the United States, is the headquarters and the chief centre of the Bay State Street Railway. Competition is keener here, though through routings and universal transfer stations are maintained. Where surface traffic is exceptionally dense, the lines pass through a shallow subway, which might well be compared with the L.C.C. tramway subway under Kingsway, in London. In this way congestion is avoided, and cars can be scheduled on a short headway. There are three principal terminals in Boston for these lines.

Outside Boston the company operates approximately 550 miles to the north of the city, serving eight considerable towns, and to the south 400, with five towns. All the connecting suburban and inter-urban lines joining these towns, besides seventy-seven smaller ones, and the inter-urban lines to the City of Providence, R.I., and to New Bedford, Mass., are associated with the Bay State system. From the above, and the map reproduced, it will be seen easily that all classes of traffic require to be dealt with.

The Bay State Street Railway is worked upon what is known as a single wire system, 500 volt circuit, with rail return. It has a number of direct current generating stations situated at successive points along the system; and one operating current station (13,200 volts), which practically controls all lines south of Boston. This station is on tidewater at Quincy, Mass., with transforming substations at Quincy, Brickton, Bridgewater, Taunton, and Fall River. There is also one operating current unit installed in the Lowell Power station, which transmits high tension current to the substation at Hudson, N.H., for distribution of 500 volt current to the Nashua lines.

The rolling-stock equipment owned consists of 2,113 motor cars, fitted with arrangements for receiving current from the overhead contact lines; 30 trailer cars; 158 miscellaneous cars; and 231 electric ploughs. The electric cars employed are thoroughly serviceable, and equipped for speed and the safety and comfort of passengers. The open cars are used except during unsuitable weather.



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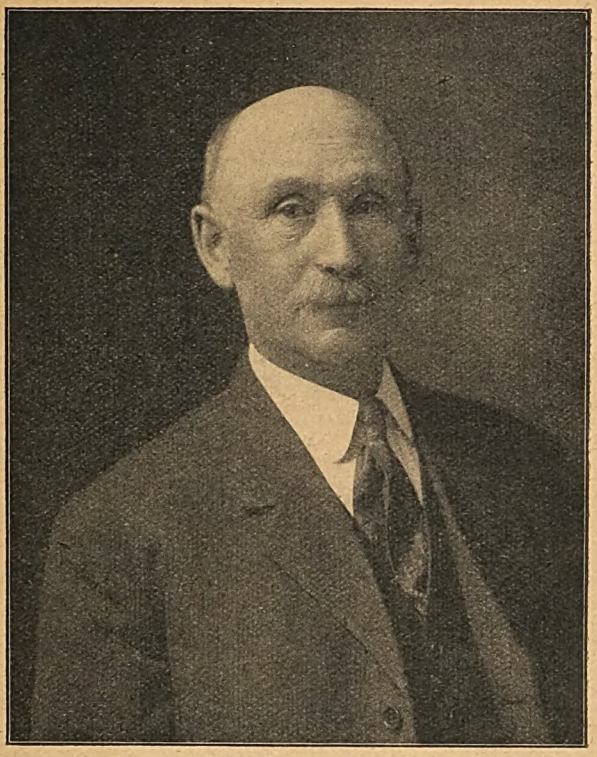
The work of the freight department is extensive. Among other duties it conducts a fast goods service between Boston and the surrounding towns already referred to. A large freight terminal is located at 543, Commercial Street, Boston. Further, the company provides lighting in the City of Newport, R.I., and owns and maintains eight pleasure parks.

It will not be inappropriate to mention some of the incidental tourist and special facilities offered by the Bay State Street Railway Company. These would, perhaps, appear unusual in this country.

A service of special cars for private parties may be secured at any time and at regular fares. The cost of open chartered cars is calculated by multiplying the regular fare by the seating capacity of the car. The chartering of special cars for parties going on visitations, outings and other trips is exceedingly popular in the United States. Open cars are, as a rule, preferred.

In the past few years many persons have taken advantage of the combination trolley and boat trip between Boston and New York, N.Y., which generally comes into effect about June. Cars are run on the Bay State Railway in connection with the screw-steamers of the Hartford and New York Transportation Company. Besides this, there is an "all trolley" trip to New York, providing a journey of 267 miles in electric cars across southern New England. The trip is accomplished in three days, with stop-overs for the night at New Haven, Conn., and Providence, R.I. A shorter variation, however, may be taken advantage of, with time divided so that the night is spent at New London, Conn. Fourteen changes of cars are necessary throughout the entire journey. For the convenience of passengers, local tickets covering the whole trip are issued assembled and bound in book form.

Time-tables in folder form are issued separately for each division on the system. During the rush hour periods of the day in towns, cars are run upon as frequent a headway as one minute; and on country, suburban and inter-urban lines, a half-hourly or hourly service is usually maintained. We quote the following from the time-tables of the Chelsea division, where traffic is fairly heavy :—



MR. P. F. SULLIVAN.
President, Bay State Street Railway.

"Leave BOSTON, Scollay Square Subway station, for: Beachmont (41 minutes), Week-days, 1.15, 2.30, 3.45, 4.55, 6.01, 6.26, 6.41, 6.56, 7.11, 7.21, 7.41, 7.51, 8.11, 8.26, 8.41, 8.56, 9.26, 9.41, every 20 minutes to **4.41, 4.56, 5.11,** every 7 and 8 minutes to **5.56,** every 15 minutes to **7.41,** every 20 minutes to **11.01,11.26,11.56,12.26.** Return, leave Beachmont, Week-days, 1.53, 3.08, 4.20, 4.48, 5.18, 5.43, 5.58, 6.13, 6.28, every 10 minutes to 7.28, every 15 minutes to 8.58, every 20 minutes to **3.58,** every 15 minutes to **6.58,** every 20 minutes to **10.18, 10.43, 11.13, 11.43, 12.41.** Morning times (1.00 A.M. to 12.59 P.M.) ordinary type. Afternoon and evening (1.00 P.M. to 12.59 A.M.), black type."

Sunday services differ, a less frequent service being sufficient.

Statistics for the year ending June 30th, 1915, are as follows :—

Passenger revenue ..	$8,819,633
Fare passengers	181,134,430
Transfer passengers ..	24,172,155
Free transfer (including employees)	7,674,258
Total passengers carried ..	212,980,843

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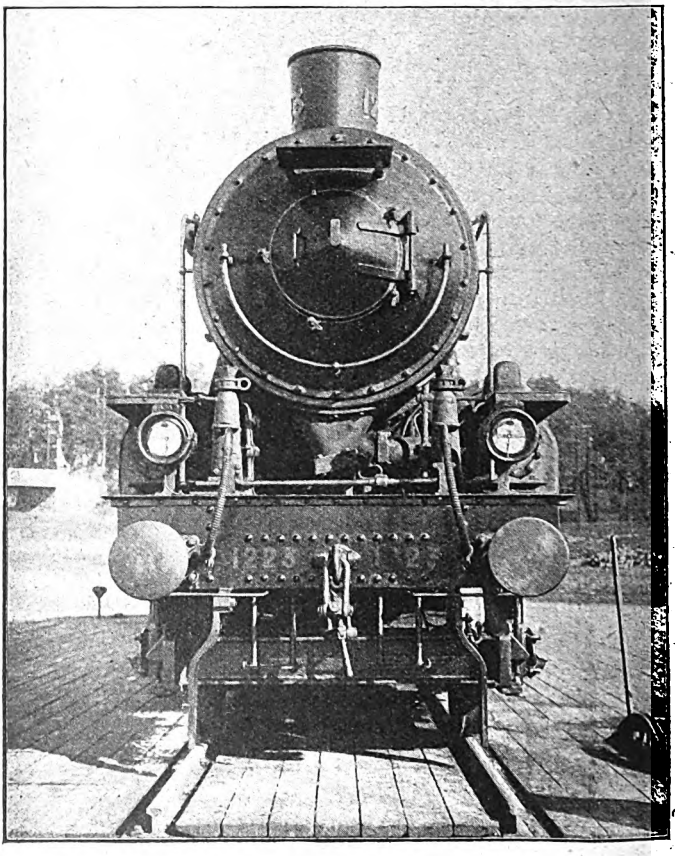
Mr. Patrick Francis Sullivan is the President of the Bay State Street Railway Company. He hails from Cork, Ireland, and went to America to settle in Lowell, Mass., in 1873. About 1886 a committee from the Lowell Horse Railroad and the Lowell and Dracut Street Railway offered him the position of Joint Secretary, which he reluctantly accepted, but was soon interested in the pending problem of electrification. The two roads were consolidated in 1891, and he became General Manager. He went abroad to study continental railway systems, and upon his return handled his own problems with renewed confidence. In 1899 seventy-one street railway companies of Massachusetts were consolidated, and Mr. Sullivan was elected President of these large and diverse interests, which culminated in the final consolidation of the Eastern Massachusetts Railway interests under the title of the Bay State Street Railway Company, of which he likewise became President and Director.

"AGA" LIGHTING FOR LOCOMOTIVE HEADLAMPS.

Mr. Halvar A. Berggren, of the Gasaccumulator Co., Stockholm, writes: "It might interest you to learn that the Swedish State Railways have recently ordered complete AGA lighting outfits for twenty (20) of their most modern express locomotives, and it is understood that practically all express locomotives will be fitted with AGA lighting as soon as next year's funds will be available. I am sending you enclosed photo of express engine No. 1223 (reproduced on this page), on which the AGA lighting system was given a nearly two years' severe test under all kinds of climatic conditions before our system was adopted by the State Railways. AGA lighting for motor-driven inspection cars has of late become very popular here in Sweden, and I am also enclosing a photo (not used) of one of the many cars of the State Railways with AGA projector; the AGA installation lights the track for something like 800 ft. in advance."



SWEDISH STATE RAILWAYS LOCOMOTIVE FITTED WITH "AGA" ACETYLENE HEADLIGHTS.

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War Time Train Services: January, 1917.

IN past years the appearance of the summer time-tables has been anxiously looked for in order to ascertain what notable developments were to be forthcoming; but January 1st, 1917, has witnessed changes which must sadden the hearts of all who have interested themselves in British railway "progress." Yet there is another aspect: that these drastic decelerations, alterations and withdrawals represent part of our contribution to Imperial necessities, and that while these changes are in a sense retrograde, and take us back to the railway services of twenty years ago and more, they are essential, not so much that Britain's actual need is so great, but that she has to contribute so largely to the needs of the Entente powers considered together, while the railways must share with the general public the necessity for co-ordinating everything to the work in hand, that of prosecuting the war to a speedy and satisfactory conclusion.

While fare increases and travel restrictions are designed to eliminate unnecessary travel, it is inevitable that many who should not be affected must suffer, and it is admitted that the former will press very hardly upon many people to whom even the old fares were an important consideration. It is not, however, practicable to discriminate closely, without setting up a large and comprehensive machinery and organisation, and the maintenance of workmen's, season, traders' and zone tickets at the ordinary rates, with the retention of ordinary fares on the London tube and underground lines in the central area, has gone far to meet the most severe objections. That the cost of even a monthly season ticket is a consideration to some people is admitted, for all are not munition workers, nor are they making greater incomes than formerly or receiving war bonuses. But on the whole the methods adopted appear to be as fairly framed as the situation would permit; while the station closures, and train decelerations and withdrawals have for their object first to release further men from railway service; secondly to enable engines and rolling stock to be freed for other duties and to enable traffic to be worked with lessened staff, as by enabling one engine (or engine crew) to do work which has hitherto required two, or two in place of three, and so on; to allow of smaller engines taking maximum loads unaided; and in other ways to permit of the necessary economies in material and men to be realised.

Speaking in the House of Commons on December 21st, Dr. Addison, Minister of Munitions, said: "The increased tonnage in munitions has necessarily thrown greatly added burdens upon transport facilities, both at home and abroad. After consultation with the President of the Board of Trade and the Railway Executive Committee, it has been decided, with a view to assisting in the rapid and effective provision of the requirements of the Director-General of Military Transport, to take from existing services certain locomotives, railway trucks, and a proportion of non-essential lines. Some privately-owned trucks will be required, and the owners are co-operating for this purpose. This necessitates a considerable curtailment of non-essential services, and the Government is satisfied that it can look confidently to the public cheerfully to put up with these restrictions. I should also like to add that our self-Governing Dominions and India are rendering in this matter the most prompt and patriotic co-operation."

The first intimation of drastic New Year changes was that in order to deal with difficulties which had arisen in Ireland the Government had decided to take possession of the Irish railways under the Regulation of the Forces Act, 1871, on the same basis as the English lines.

At the same time preliminary indications were given of drastic train alterations in England, Scotland and Wales to come into force on January 1st.

This was followed by the issue in December of an Order in Council conferring extensive powers on the Board of Trade in regard to railways, secured by adding the following after Regulation 7A in the Defence of the Realm Regulations:—

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7B.—(1) The Board of Trade may, for the purpose of making the most efficient use of railway plant or labour, with a view to the successful prosecution of the war, make orders for all or any of the following purposes, namely:—

(a) for enabling the Board of Trade to take possession of any private owner's wagons and to use those wagons in such manner as they think best in the interests of the country as a whole, on such conditions as to payment, use, and otherwise as may be provided by the order;

(b) for enforcing the prompt loading or unloading of wagons by making failure to load or unload in accordance with the order an offence;

(c) for curtailing any statutory requirements as to the running of trains or affording other facilities on certain lines or at certain stations or for requiring the disuse of any such line or station, in cases where the curtailment or disuse appears to the Board of Trade to be justified by the necessity of the case;

(d) for restricting or prohibiting certain classes of traffic (including the carriage of passengers' luggage) on railways either absolutely or subject to any conditions for which provision is made by the order:—

(e) for modifying any statutory requirements with respect to the maximum amount of passenger fares.

(2) If any person acts in contravention of or fails to comply with any of the provisions of an order so made he shall be guilty of a summary offence against these Regulations.

(3) Any order may be made so as to apply generally to all railways or to any class of railways or to any special railway.

(4) Any order of the Board of Trade under this Regulation may be revoked, extended, or varied as occasion requires.

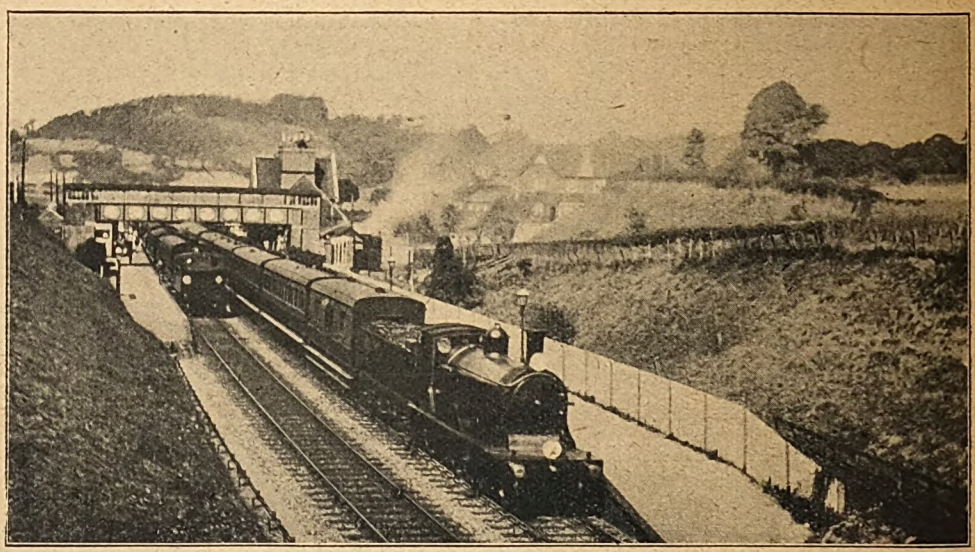
This was accompanied by a statement issued under date of December 21st by the Board of Trade as follows:—

The Board of Trade have to-day made orders under Regulation 7B, of the Defence of the Realm (Consolidation) Orders, 1914, authorising the railway companies of Great Britain, on and after January 1st, 1917: (1) to increase passenger fares by one half; (2) to refuse to carry luggage exceeding a total weight of 100 lb. per passenger.

It is intended that these Orders shall be applied generally, but certain exceptions will be publicly announced later by the Railway Executive Committee.

The increase of passenger fares will not apply to: (a) workmen's tickets; (b) season tickets; (c) traders' tickets; (d) zone tickets, where an arrangement for the issue of such tickets is in operation.

It should be explained that the increase in fares is not intended as a means of increasing the revenue of the railways, but is put into force solely with the object of curtailing passenger traffic, in order to enable the railway companies to comply with the urgent demands that have been made upon them for the conveyance of troops, munitions, and supplies, both in Great Britain and in France.



Photo] *E. A. Gurney Smith.]*

LONDON AND SOUTH WESTERN RAILWAY.

Up train at Seaton Junction. Branch train on down line.

In regard to goods and coal traffic, the Railway Executive Committee, under date December 22nd, announced that as from Tuesday, January 2nd, 1917, "all open goods and coal wagons suitable for general purposes, belonging to railway companies under Government control, may be loaded with merchandise consigned to any station on or beyond the line of any of the controlled companies, irrespective of the ownership of such wagons, and of the routes by which

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they were received either full or empty. Traders requiring further particulars should apply to the local railway companies. It is urged upon traders that in the national interest it is of the highest importance that all wagons shall be liberated and placed to further service with the utmost expedition, as to allow wagons to remain under load is to enhance the difficulties under which the transport is being carried on with prejudicial effect to the movement of urgent munitions and Government stores essential to the conduct of the war."

On December 23rd, the Railway Executive Committee gave notice that on and from January 1st, 1917, passengers who are holders of traders' or other season tickets will be required to produce them in exactly the same way as holders of ordinary tickets, and if they fail to do so will be required to pay the full ordinary fare.

In order to meet the new conditions created by the widespread alterations referred to, passengers holding ordinary, season or traders' tickets covering points directly served by two or more companies' lines, are allowed to travel, for the throughout journey only, by any route so available. In cases where through tickets have been issued, and there is no direct through service, a passenger is permitted to complete the journey by a recognised alternative route. Those arrangements do not apply to local residential services unless specially authorised. In many cases where returns were cheaper than two singles, the reduction has been abolished.

In regard to the Underground railways in London, subsequent announcements explained that the increase of fares would not apply on the District line within the following limits: Acton Town in the west, Putney Bridge in the south, and Bow Road in the east. The three sections of the London Electric Railway, Central London and City and South London Railways, are not affected, and this is further the case in regard to the Inner Circle, and stations on the Hammersmith and City, and Great Northern and City lines. Local and through fares between these groups, and within the limits shown remain unaltered. In the case of bookings to and from stations outside the limits 50 per cent. is added.

Naturally there has been considerable opposition to fare increases, and on January 18th the Secretary of the War Office announced that officers and other ranks who are in possession of the military concession Army Form W.3504 or O.1800 will, from January 19th, be charged only at the rates in operation prior to January 1st, 1917.

The arrangements for the "common user" of certain classes of open goods wagons between various groups of railway companies, which have been in operation during 1916, have proved very beneficial, and the principle has been extended, commencing on January 2nd, to embrace the same kinds of wagons belonging to the whole of the Government-controlled railway companies.

To enable the equation between the various companies to be conducted with as little difficulty as possible, it was agreed that Great Britain should be divided between the following twelve companies:—

Great Central.
Great Eastern.
Great Northern.
Great Western.
Lancashire and Yorkshire.
London and North Western.
London, Brighton and South Coast.
London and South Western.
Midland.
North Eastern.
South Eastern and Chatham.
One of the Scottish Companies.

All the other railways are allocated between these. Adjustments of exchange are made between the twelve companies enumerated, and they in turn adjust with the other companies allocated to them.

The following companies have been included in the respective groups:

1. Great Central—
   Cheshire Lines Committee.
   Great Central and Midland Joint.
   Great Central and North Staff. Joint.
   Great Central H. & B. and Mid. Joint.
   Metropolitan.
   Metropolitan and Great Central Joint.
   Manchester, L. Jc. and Altrincham.
   South Yorkshire Joint Line.
2. Great Eastern—
   Colne Valley and Halstead.
3. Great Northern—
   East and West Yorkshire Union.
   Midland and Great Northern Joint.
   Norfolk and Suffolk Joint.
4. Great Western—
   Alexandra Docks and Railway.
   Avonmouth Light Railway.
   Barry.
   Brecon and Merthyr.
   Cardiff.

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Great Western and Great Central Joint.
Metropolitan District.
Metropolitan and Metropolitan District. City Lines and Extensions.
Neath and Brecon.
Port Talbot Railway and Dock.
Rhondda and Swansea Bay.
Rhymney.
Shropshire and Montgomery.
South Wales Mineral.
Taff Vale.
Whitechapel and Bow.

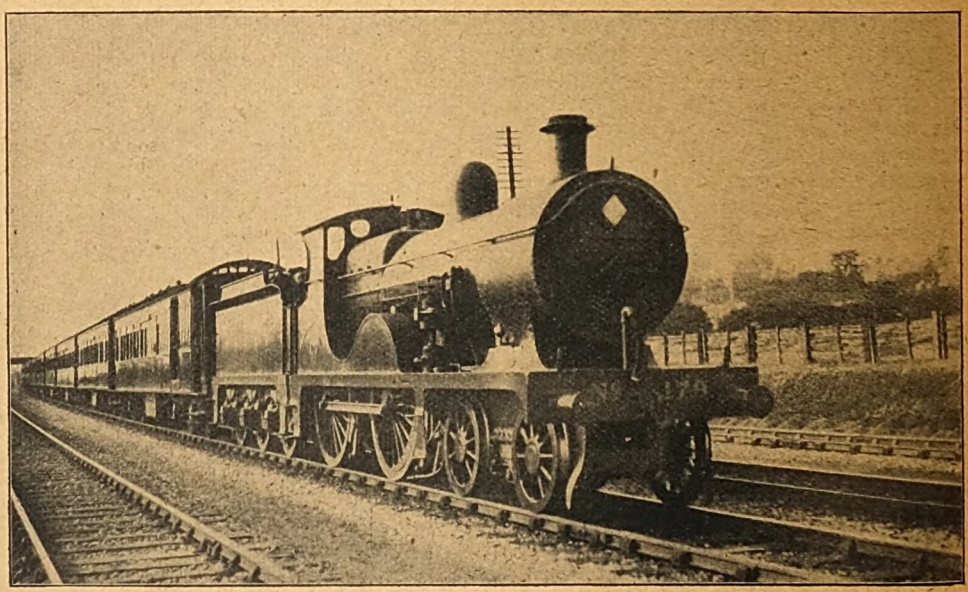
5. Lancashire and Yorkshire—
Axholme Joint.
Dearne Valley.

11. South Eastern and Chatham—
Kent and East Sussex.

12. A Scottish Company—
Caledonian.
Glasgow and South Western.
Great North of Scotland.
Highland.
North British.

The Scottish companies are associated, as they have been under the previous scheme, the equation as between them and the English companies being made as a whole. Certain smaller lines, *e.g.*, the Cockermouth, Keswick and Penrith, are regarded as merged in a neighbouring large line.

The method of working "common" user



Photo] [*W. H. C. Kelland.*

SOUTH EASTERN AND CHATHAM RAILWAY.

4.25 p.m. Folkestone Car train near Grove Park. 4–4–0 engine No. 179.

6. London, Brighton and South Coast.
7. London and North Western—
Cambrian.
Furness.
North Staffordshire.
Oldham, Ashton and Guide Bridge.
Wirral.
8. London and South Western—
Midland and South Western Junct.
Weymouth and Portland.
9. Midland—
Hull and Barnsley.
Somerset Joint Committee.
Stratford-on-Avon and Midland Junct.
10. North Eastern Railway.

wagons throughout the country is similar to that now in operation between the Great Western, Lancashire and Yorkshire, London and North Western, Midland, and North Eastern group, *i.e.*, to ensure the proper equation of stock between the separate companies, the number-takers at all junctions where exchange of traffic takes place, also at places where exchange is effected with collieries, docks, etc., to which several companies have access, take a record of all loaded and empty wagons separately of the agreed types exchanged, and the difference between the number of loaded wagons passing between the various companies is

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adjusted by the "payment" of a corresponding number of empty wagons.

Details are rendered to the Railway Clearing House, where the information is summarised and returns compiled as bases for the adjustments.

At each junction where traffic is exchanged a record is kept of all loaded and empty wagons of agreed types which are exchanged, and the difference in the total exchange adjusted by the "payment" of a corresponding number of empty wagons. Repayments are made at agreed junctions between the companies concerned, and apart from repayments no empty wagons will be exchanged between companies. Certain classes of stock are excluded from the new system of working. Common user stock consists of ordinary open goods, mineral and coal wagons having sides of three or more planks with doors on both sides the full depth of the wagon. The exceptions are :—

Wagons with through top planks or fixed sides.

Wagons exceeding 21 ft. in length over buffers.

Wagons exceeding 10 ft. 6 in. wheelbase.

Wagons marked as service vehicles—*e.g.*, loco. coal.

Wagons specially constructed for conveying coke.

Wagons specially lettered as reserved for military traffic.

Great Western Company's Vacuum Fitted Wagons.

Lancashire and Yorkshire Company's wagons *not* marked with four white crosses on each side.

Midland Company's Hopper bottom, end-door and 12-ton high-sided wagons.

Wagons belonging to the following lines :—

Bishops Castle.
Derwent Valley.
Felixstowe Dock and Railway.
Gwendraeth Valley.
Llanelly and Mynydd Mawr.
Manchester Ship Canal.
Redruth and Chacewater.
Stocksbridge.

Covered vans of all descriptions, bolster trucks, cattle wagons, vehicles specially constructed for conveying heavy and bulky traffic are also not to be used in common, and will continue to be worked in accordance with pre-existing regulations.

Official announcements applying to these new arrangements are as follows :—

Notice is hereby given that the following alterations in passenger train travel, as applying to the railways in Great Britain, will come into force on and from January 1st, 1917 :—

1. PASSENGER TRAIN SERVICES.
The passenger train services will be considerably curtailed and decelerated. For details see the company's time-tables and notices.
2. RESERVATION OF SEATS, COMPARTMENTS, ETC.
The reservation of seats and compartments, and saloons for private parties, will be discontinued.
3. SLEEPING AND DINING CARS.
The running of sleeping and dining cars will be curtailed.
4. THROUGH COACHES.
The running of certain slip coaches and through coaches off main line trains to branch lines will be discontinued.
5. PROHIBITION OF CONVEYANCE OF MOTOR CARS, CARRIAGES, ETC.
Road vehicles, such as motor cars, carriages, show vans, etc., will not be accepted for conveyance by passenger train.
6. INCREASE OF FARES.
All passenger fares, except workmen's tickets (daily and weekly), season, traders' and zone tickets, will be increased by 50 per cent.
7. CANCELLATION OF REDUCED FARE FACILITIES.
Reduced fare facilities will in certain cases be discontinued. See announcements by individual companies.
8. INTER-AVAILABILITY OF TICKETS.
Passengers holding ordinary, season, or traders' tickets covering points directly served by two or more companies' lines will be allowed to travel, for the throughout journey only, by any route so available.
In cases where through tickets have been issued and there is no direct through service a passenger will be permitted to complete the journey by a recognised alternative route.
These arrangements will not apply to local residential services unless specially authorised.
9. LIMITATION IN WEIGHT OF LUGGAGE ACCOMPANYING PASSENGERS.
The railway companies will not undertake to give assistance in the handling of passengers' luggage.
Subject to certain exceptions, the amount of ordinary personal luggage allowed free of charge will be 100 lb., irrespective of the class of ticket held, and no passenger will be permitted to take more than 100 lb. weight of luggage by train.

By Order,
THE RAILWAY EXECUTIVE COMMITTEE.
London, December, 1916.

This was accompanied by the following intimation :—

Notice is hereby given that, on and from January 1st, 1917, passengers who are holders of traders' or other season tickets will be required to produce them in exactly the same way as holders of ordinary tickets, and if they fail to do so will be required to pay the full ordinary fare.

By Order,
THE RAILWAY EXECUTIVE COMMITTEE.
London, December, 1916.

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Specimen Tables of Classified Train Services from London: January, 1917.

I.—DOWN ANGLO-SCOTTISH SERVICES.

													AC	AE	B		A	G		F	D	A
Euston	—	4.55	—	—	**9.30**	9.45	—	**1.15**	—	**7.30**	—	8.30	—	**8.50**	—	—	—	**11.30**	11.45
King's Cross	—	—	4.55	—	—	—	**10.0**	—	**2.0**	—	**7.45**	—	8.30	—	—	—	**10.30**	—	—
St. Pancras	2.35	—	—	**9.15**	—	—	—	—	—	—	—	—	—	—	**9.10**	**9.15**	—	—	—
Edinburgh	4.0	4.33	3.47	—	—	9.25	**7.30**	—	**11.30**	—	**4.45**	—	5.55	—	—	—	**8.0**	—	—
Glasgow	4.45	4.55	—	**7.20**	—	9.25	—	**11.5**	—	—	—	—	—	**7.50**	—	**8.10**	—	**9.40**	2.0
Perth	—	6.45	—	—	**8.20**	—	—	**12.51**	—	**6.25**	—	8.40	—	**9.15**	—	—	—	—	—
Dundee	—	—	—	—	—	—	**9.52**	**1.35**	—	—	**6.28**	8.40	8.58	—	**10.5**	—	—	—	—
Aberdeen	—	—	—	—	**11.5**	—	—	**3.20**	—	—	**8.49**	11.20	—	—	**12.24**	—	—	—	—

A—Not Saturday nights. B—Saturday nights only. C—Sleeping car to Inverness. D—Sleeping car to Glasgow. E—Sleeping car to Aberdeen. F—Sleeping car to Edinburgh. G—Sleeping car runs to Edinburgh, but is not available for passengers thereto, though it can be used by those travelling to South of Scotland stations, or beyond Edinburgh.

II.—LONDON-MANCHESTER AND LIVERPOOL SERVICES.

																			A	B				
Euston ..	—	4.55	6.50	—	—	**9.30**	9.45	—	11.50	—	**12.5**	—	**2.20**	—	**3.55**	—	**5.30**	—	7.15	8.45	9.25	—	**11.45**	—
St. Pancras	2.35	—	—	7.35	—	—	—	**9.50**	—	**12.0**	—	—	—	—	—	**4.15**	—	**6.10**	—	—	—	—	—	**12.10**
Marylebone	—	—	—	—	**8.45**	—	—	—	—	—	—	12.15	—	**3.15]**	—	—	—	—	—	—	—	**10.0**	—	—
Manchester	7.14	10.43	12.45	12.55	**3.33**	—	3.39	**2.47**	—	**5.25**	**6.5**	5.21	**7.0**	**7.55**	**9.20**	**8.50**	**10.30**	**11.0**	1.35	1.35	3.10	**3.50**	**5.55**	**5.48**
Liverpool	—	10.32	12.30	—	—	**2.10**	3.25	—	4.35	—	**5.40**	—	**7.16**	—	**9.7**	—	**10.15**	—	12.45	—	3.15	—	**6.15**	—

A—Saturdays excepted. B—Saturday nights only.

III.—LONDON-BIRMINGHAM SERVICES.

Euston	4.55	—	6.50	**9.20**	9.45	—	—	**11.50**	**1.50**	—	**4.35**	—	5.0	—	**6.55**	—	**8.50**	10.50	—
Paddington	—	6.30	—	—	—	9.50	**10.30**	—	—	**2.0**	—	4.55	—	**5.30**	—	**7.30**	—	—	12.17
Birmingham	8.4	10.35	10.22	**12.0**	1.25	12.48	**1.0**	**2.40**	**4.20**	**4.30**	**7.5**	7.48	8.45	**8.0**	**9.39**	**10.25**	**11.50**	2.15	3.48

NOTE.—A number of the connections given may require changing; they are, however, included as the facilities specified *are* available, though in some cases it is unlikely that through passengers from London would utilise them. A number of the services, particularly in Table I., do provide facilities to other stations included, but they are not available for passengers from London. Principal services are noted in thick type.

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As realised in practice, the general characteristics are :—

(1) Withdrawal of all slip coaches, trains stopping instead. This saves the special staff and equipment necessitated by such facilities.

(2) Classification of traffic on particular routes. This is most obtrusively indicated by the Anglo-Scottish service, which, speaking generally, gives the Stirling, Perth, and Highland Railway traffic to the West Coast Route, Edinburgh, to the East Coast, Aberdeen, and Great North of Scotland, according to train and time of day to particular routes, and Glasgow to the West Coast and Midland routes, the various Scottish districts being correspondingly classified. Similar arrangements apply to services from various English towns to Scotland; also between the various centres of traffic in England and Scotland.

(3) Duplicating and more or less equivalent train services are almost entirely avoided, so that from London to Birmingham one has to go either to Euston or Paddington, according to the time of day, and similarly to Euston, King's Cross, St. Pancras, or Marylebone, for Manchester, Liverpool, Leeds, etc., according to train.

(4) Numerous trains are considerably decelerated, and many of the long non-stop runs disappear, or are reduced to an amble along at 40–45 miles per hour.

Reductions are not, however, very serious on suburban lines, as the volume of travel is still as great as ever, and in some respects even heavier, seeing that the replacement of men by women has actually increased the numbers travelling on many sections, and there are the munition workers to consider. There are, however, considerable reductions in the Sunday train services.

State Control of Irish Railways.

The Executive Committee appointed for the purpose of controlling on behalf of the State the railway systems in Ireland consists of Sir William Byrne, Under-Secretary, nominated by the Board of Trade as Chairman; Mr. E. A. Neale, General Manager, Great Southern and Western Railway, Acting-Chairman; Mr. Joseph Ingram, Irish Railway Clearing House, Secretary; Mr. John Bagwell, General Manager, Great Northern Railway; Mr. M. F. Keogh, General Manager, Midland Great Western Railway; and Mr. J. Cowie, General Manager, Northern Counties Committee.

It is officially announced that, as various Irish railways and steamship companies have intimated that they require increased payments for the carriage of certain classes of goods traffic, including live stock, to which through rates are applicable, the principal English railways intend, subject to the statutory maxima, to increase specified rates. The change is made at the request and for the benefit of the Irish companies, as their increased expenses necessitate additional remuneration for the portion of the through route over which they carry the traffic, and the amounts by which through rates are increased will be apportioned solely to these companies, and received by them. The new rates come into force on February 1st.

Closed Stations and Halts.

The list of closed stations and halts is a long one, and the following may be mentioned :—

London and North Western Railway. Aspley Guise Halt, Bath Road Halt, Bow Brickhill Halt, Carpenders Park, Carr Mill, Chalk Farm, Charlton Halt, Cheadle, Church Brampton, Churwell, Friezland, Hale Bank, Hammersmith, Horley Hill, Husborne Crawley Halt, Kempston and Elstow Halt, Kempton Hardwick Halt, Kilburn, Llong, Loudoun Road, Lowton, Maiden Lane, Mochre and Pabo, Monmore Green, Moore, Nantlle, Oddington Halt, Over and Wharton, Oxford Road Halt, Pleck, Pont Rug, Port Meadow Halt, Queen's Park (exclusive of Bakerloo platforms), Rhosneigr, Rugby Road Halt, Sankey Bridges, Staincliffe and Batley Carr, Star Crossing Halt, Upper Mill, Wendlebury Halt, Wolvercote Halt, Wootton Broadmead Halt, Wootton Pillinge Halt, Woodstock Road Halt.

Great Western Railway. The following branches closed: Alcester and Bearley, Titley and Eardisley, Moorswater and Caradon, Monmouth and Coleford, †Uxbridge (High Street) and Denham, Bridport, East Street, and West Bay. The following stations and halts will also be closed: *Alcester, Almeley, Bassaleg (Great Western), Berwig Halt, Brampford Speke, Cheltenham (Malvern Road), *Coleford, Daisy Bank, Dawlish Warren, Dunstall Park, *Eardisley, Great Alne, Hart's Hill and Woodside, Ide, Lightmoor Platform, Linley, Llangeinor, †Llangonoyd, Lyonshall, Newland, Penar Junction Halt, †Pontnewydd (Lower), Pontrhydyrun, St. Lawrence Platform, †Saltney, Stretton-on-Fosse, Teign-

* Closed for Great Western Railway trains only. † Closed for passenger traffic only.

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grace, Tidenham, †Uxbridge (High Street), Vicarage Crossing Halt.

The following stations are closed on Sundays: Ashburton, Bearley, Brixham, Bovey, Bridport, Buckfastleigh, Buttington, Carbis Bay, Causland, Clevedon, Clifton Bridge, Claverdon, Colnbrook, Combe Junction, Daisy Bank, Dunstall Park, Hanwood, Heathfield, Helston, Kingsland, Kington, Lelant, Looe, Lustleigh, Marlborough, Middletown, Moretonhampstead, Nancegollan, Pembridge, Pill, Powerstock, Portbury, Portishead, Sandplace, St. Ives, St. Keyne, Staines, Staverton, Stratford-on-Avon, Titley, Toller, Twerton-on-Avon, Westbury (Salop), Wilmcote, Yockleton.

London, Brighton and South Coast Railway. South Bermondsey, Old Kent Road, Tooting Junction, Haydon's Road, Merton Abbey, Selsdon Road, Lewes Road, Kemp Town, The Dyke, Ifield Halt, Roffey Road Halt, Littlehaven Halt, St. Leonards (Warrior Square). The following stations are closed on Sundays only: Anerley, East Brixton, North Dulwich, Selhurst, Waddon, Purley Oaks; Earlswood, Hartfield, Barcombe.

London and South Western Railway. The branch line between Basingstoke and Alton (Hampshire), serving the three stations of Cliddesden, Harriard, and Bentworth, has been entirely closed. Chard Town station is closed for passenger and parcels traffic. All traffic for Chard Town is dealt with at the Great Western and London and South Western Chard Joint station, to which a revised train service to and from Chard Junction is provided. Goods traffic is dealt with at Chard Town station as hitherto.

South Eastern and Chatham Railway. Nunhead–Greenwich Park and Crystal Palace lines closed, and trains cease to run between Beckenham Junction and Norwood Junction and Crystal Palace.

The South Eastern and Chatham Railway have also closed the following stations (some continue to deal with goods traffic):—St. Leonards (Warrior Square), Rochester Bridge, Sevenoaks (Bat and Ball), Suntham, Reedham Halt, Box Hill, and Selsdon Road. On Sundays St. Paul's, Denmark Hill, Peckham Rye, Nunhead, and all stations on the Catford loop are closed. Also Brookland, Lydd, New Romney, Dungeness, Lyminge, Elham, Barham, Bishopsbourne, Bridge, South Canterbury, Chevening Halt, Brasted, Westerham, Horsmunden, Goudhurst, Cranbrook, Hawkhurst, Ebbsfleet Halt, Hythe, Sandgate, Eden Park, West Wickham, and Hayes. South Eastern and Chatham Railway train services between Sanderstead, Upper Warlingham, Woldingham, Oxted and Hurst Green have been suspended, week-days and Sundays.

Caledonian Railway. A number of stations closed, and the whole of the ordinary Sunday passenger trains withdrawn, except those for coastal passengers, while certain non-essential traffic is not conveyed by passenger trains. Stations closed for passenger traffic:—In Glasgow—Botanic Gardens, Crosshill, Glasgow Green, Kelvin Bridge, Kelvinside, Kirklee and Pollokshields (East). Also the Nelson Street and 15 Saltmarket Parcels Offices, and the Union Street and Hope Street Booking Offices. On other portions of the system: Achnacloich, Ardrossan Town (Cal.), Ardrossan (Montgomerie Pier), Auchenmade, Baldragon, Ballachulish Ferry, Bogston, Bowling, Calder, Cambusnethan, Cleland, Clocksbriggs, Colzium, Drumclog, Fallside, Forniegair, Gartsherrie, Highlandman, Innerpeffray, Irvine (Cal.), Kilwinning (Cal.), Kingsknowe, Lochee (West), Lochearn head, Lugton (Cal.), Morningside, Neilston (Cal.), Newmains, Overtown, Patterton, Perth (Princes Street), Ravenscraig, Robroyston, Rockcliffe, Ryeland, Saltcoats (Cal.), Strathaven North, Stevenston (Cal.), Uplawmoor, and Whifflet (High Level).

North British Railway. The following stations have been closed for passenger and goods traffic, with the exceptions noted:—*Camelon, *Lochburn, Finnieston, Clydebank Central, Mount Vernon, Uddington West, Gallowgate Central, Carntyne, Bargeddie, Peacock Cross, *Kinniel, *Barnhill, *Yoker, *Broomhouse, *Uddingston, †*Coatbridge Central, †*Bellshill, †*Whifflet, †*Bothwell, *Yorkhill, †*Burnbank, †*Hamilton, †*Alexandra Park, †*Springburn, Duke Street, †Possilpark, *Whiteinch, Campsie Glen, Esplanade, Pittenweem, Mount Melville, Boarhills, West Wemyss, Halbeath, Clackmannan Road, Sauchie, Kingskettle, *Causewayhead, †*Sinclairtown, Trinity, Easter Road, Leith Walk Passenger, Bonnington Passenger, Powderhall, Junction Road, Craiglockhart, Blackfordhill, Piershill, Broomieknowe, Cossgatehall Halt, Eskbridge, Pinkhill, Saughton, *Rosslynlee, *Gilmerton, *North Leith, *Granton, *Dalkeith, Port Carlisle.

† Closed for passenger traffic only.

* Open for goods traffic only.

† Opened morning and evening for workmen's trains only.

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Midland Railway. – Hazlegrove entirely closed, and Cheadle Heath on Sundays.

The Cheshire Lines Committee have closed down the following stations for passenger and parcel traffic: Sefton, Lydiate, Altcar and Hillhouse, Moss Bridge, Woodvale, Ainsdale, Beach, Birkdale (Palace), Southport (Lord Street), and also St. James's (Parliament Street).

The Furness Railway Company have discontinued the steamers which have uninterruptedly plied up and down Lake Windermere for many years. This stoppage isolates to some extent such popular resorts as Ambleside, Bo'ness, Grasmere, and other lakeland haunts. Passengers now have to travel by train to Windermere and from there by 'bus.

Dining cars running between Edinburgh and Glasgow and between Edinburgh and Aberdeen have been withdrawn.

Train Service Alterations.

It would require far too much space to review main line alterations in detail, and a few remarks concerning principal features must suffice. For longer journeys where several railways are available, the general principle is that of dividing the work between the various railways. This is clearly shown in the three tables on page 134. Thus, passengers from London for Glasgow leave St. Pancras at 9.15 a.m.; for Perth and Aberdeen from Euston at 9.30 a.m., and for Edinburgh and Dundee from King's Cross at 10.0 a.m. Similarly, there are no Midland trains from St. Pancras to Liverpool, though for Manchester there is a wider selection of trains, mainly because of the numerous connections which become available at Crewe, than because the London and North Western takes an undue share in addition to its Liverpool monopoly, while the fact that most of the Great Central trains reach Manchester adds to the facilities. There is, of course, considerable deceleration, and one finds such times as nearly 2 hours from Euston to Rugby, and 3 hrs. 40 min. to Crewe, without stop, while on the Great Northern Railway 95 min. is a usual allowance from King's Cross to Peterborough and 2 hrs. 18 min. to Grantham.

In fact, the only trains which are almost unaltered are the morning and evening Irish mails from Euston—due to considerations affecting both ends of the journey—and a few special trains such as the 5.30 and 10.45 p.m. Newcastle trains from King's Cross, which are of special value for people travelling on national business.

It must be pointed out that in numerous instances trains noted in the tables, especially in No. I., do actually serve places not specified, but do not take London passengers. Thus the 9.30 a.m. from Euston does reach Edinburgh and Glasgow, but not from London. This has to be borne in mind in appraising these facilities, as the restrictions only apply from the Metropolis, and the trains do much of their other work as formerly, the geographical positions and connections of Birmingham, Liverpool, Manchester, Leeds, Sheffield, etc., governing the selection of route and causing the necessary distribution of traffic. Other facilities are also available by changing, and some of the trains noted in the tables require this, though as they give the connections specified they are included.

A few further trains on the lines concerned in these tables may first be referred to.

On the London and North Western Railway the disappearance of the 10.25 a.m. Liverpool and Manchester express is only partially compensated for by the Liverpool portion of the 9.30 a.m., which is taken off when other sections have to be added. Similarly, the 12.10 p.m. goes on behalf of the Midland, though the London and North Western keeps its 2.35, and 5.50 and 6.0 p.m. trains in decelerated 2.20 and 5.30 p.m. forms. The 5.20 p.m. Fleetwood boat express is booked non-stop to Stafford (7.50 p.m.), and the 7.15 p.m. is non-stop to Nuneaton (9.7 p.m.). The Stranraer sleeping car and through coaches are sent by the 7.30 p.m. The 9.25 p.m. is a slower version of the 10.15 p.m. sleeping car express for Holyhead and Dublin (North Wall).

On the East Coast route to Edinburgh the best time is now 9 hours, by the 7.45 p.m. service, and 9½ hours by the other expresses. The 8.55 a.m. Leeds–Glasgow (North Eastern Railway train) is continued, but the corresponding return leaves Glasgow at 4.0 p.m., instead of 5.0 p.m. Great Northern Railway withdrawals include the 7.15 a.m. down from King's Cross to Leeds, and the 9.0 a.m. up, with deceleration of the 10.10 a.m. and 1.30 p.m., and other trains. Other trains withdrawn are the 3.0 a.m., 3.0 p.m., 7.0 p.m., 10.45 p.m. trains, with corresponding returns. On the North Eastern Railway there is a long list of train withdrawals and alterations, while many others are retimed. The fast Sunday trains between York and Edinburgh are withdrawn. The through sleeping

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car service between London (King's Cross) and Glasgow (Queen Street), and London (King's Cross) and Perth is discontinued in each direction. The sleeping car which previously served Morpeth, Alnmouth, Belford, Berwick, Reston, Dunbar, and Longniddry, is withdrawn in each direction. The only sleeping cars now run on the East Coast route are 7.45 p.m. (to Aberdeen), 10.30 p.m. (to Edinburgh), and 10.45 p.m. (to Newcastle), and return trains. All restaurant car facilities on the North Eastern Railway system are withdrawn.

The Midland Railway has withdrawn the following train services: Lancaster (G.A.) and Lancaster (Castle); Leeds and Harrogate; Sandal and Walton and Wakefield; Sheffield and Doncaster; Sutton-in-Ashfield and Sutton Junction; Ripley and Langley Mill; Nottingham and Ilkeston, *viâ* Kimberley; Coalville (Mid.) and Shackerstone; Whitacre and Hampton; Dudbridge and Stroud; Fishponds and Clifton Down; Liverpool, Manchester and Hellifield; Barnoldswick and Earby (Sundays). Some of the services noted apply to routes whose stations are served by other trains, and it is only trains on the particular routes mentioned which are withdrawn. Others—such as the Liverpool, Manchester and Hellifield, and Leeds and Harrogate—will require passengers to travel by Lancashire and Yorkshire Railway and North Eastern Railway trains respectively. The Hampton–Whitacre service consists of only one train daily, and as it was only run to maintain statutory rights (relieved by the recent Order in Council), it will not be greatly missed.

The 4.50 a.m. Manchester, 10.25 Leeds, 11.30 Scotch, 12.10 Derby, 2.30 Manchester, and 3.40 Sheffield are withdrawn altogether. The 12.0 midnight train only runs to Leeds, and is due there at 5.47 instead of 4.3, whilst the 12.15 Manchester, due 5.25, will leave 12.10 and be due 5.48. The last has a connection with the Lancashire and Yorkshire Railway, being the only one, instead of four as previously. Instead of there being eleven West of England expresses from Derby and Birmingham to Bristol and Bath there are now only six.

On the Great Western Railway all restaurant cars have been withdrawn, and slip carriages have disappeared. The most notable omission is the "Cornish Riviera" express. A substitute leaves Paddington at 10.15 a.m., and Penzance at 9.45 a.m.; on the down journey reaching Penzance at 6.0 p.m., and on the up journey arriving at Paddington at 5.30 p.m. The 12.0 noon train from Paddington to Torquay is another favourite express to disappear, but a portion of the 10.15 a.m. train is run from Newton Abbot to Torquay and Dartmouth. The 1.30 and 3.30 p.m. from Paddington to Penzance drop out, but a substitute for the 1.30 p.m. is provided at 1.0 o'clock, *viâ* Bristol. The 3.30 p.m. disappears altogether. The 4.15 p.m. train from Paddington to Plymouth continues to run, but the time of starting is altered to 4.0 o'clock. In the South Wales section the 8.45 a.m. from Paddington to Carmarthen and the 5.35 p.m. from Swansea to Paddington is discontinued, but a connection is formed at Swindon with the 9.0 a.m. from Paddington, by which passengers will be enabled to reach Cardiff at 12.33 p.m., and Swansea at 2.10 p.m. In the opposite direction a train leaves Swansea at 5.15 p.m. and Cardiff at 7.0 o'clock in connection—at Swindon—with the train due at Paddington at 10.35 p.m. The through service between Barry Docks, Cardiff, and Newcastle disappears, also the 2.25 p.m. train from Cardiff to Crewe and Liverpool. The 2.20 p.m. train from Bristol to Crewe and the 8.15 p.m. from Crewe to Bristol are suspended.

The 8.30 p.m. express from Paddington to Fishguard Harbour, and the corresponding up boat train due at the London terminus at 11.10 a.m., are withdrawn. The 4.30 p.m. train from Paddington to Fishguard Harbour takes the whole of the passenger traffic for the South of Ireland, *viâ* Rosslare, each week night, and for Waterford and Cork alternate nights. The morning connection from Fishguard for passengers off the cross-Channel boats leaves Fishguard Harbour at 6.0 a.m. and is due at Paddington at 12.0 noon.

In the case of Birmingham, the quickest journey from London occupies 2½ hours. Some of the services disappear altogether, notably, so far as the Great Western route is concerned, the 9.10 a.m. and 4.0 p.m. trains from Paddington, and the 11.20 a.m. from Birmingham to Paddington, whilst the 4.0 p.m. from Birmingham is run by the old route, *viâ* Oxford and Reading, due at Paddington at 7.15 p.m. The 11.0 a.m., 2.30 and 6.0 p.m. from Paddington each start half-an-hour earlier. The 10.0 a.m. train from Wolverhampton and the 3.55 p.m. from Birmingham for Bristol and the West of England, *viâ* Stratford-on-Avon, and the 9.5 a.m. and 4.45 p.m. from Bristol to Birmingham and Wolverhampton by the same roads are withdrawn. Through services

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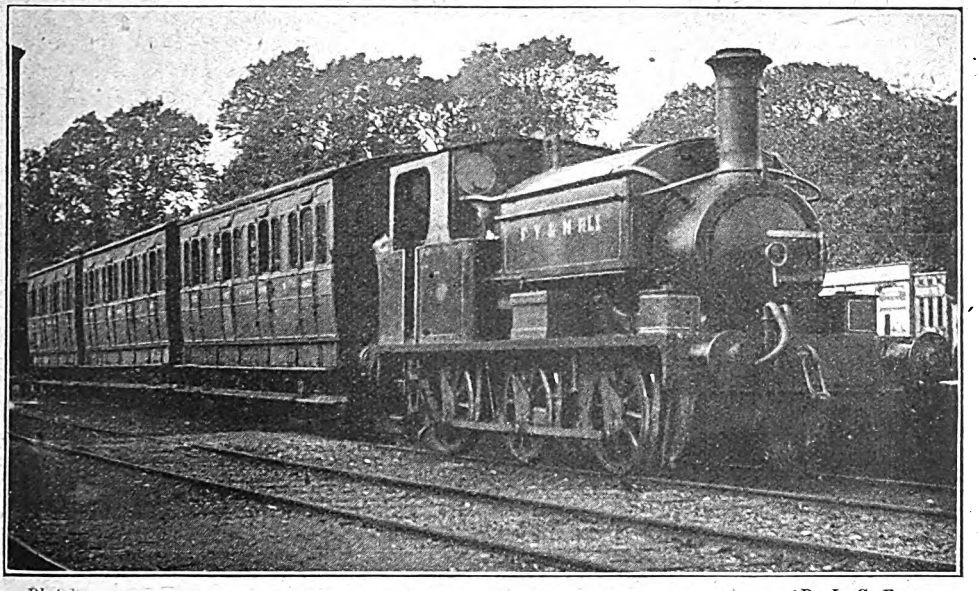
to Bournemouth and Folkestone are also discontinued. On the Worcester, Malvern and Kidderminster side, the 1.40 p.m. express from Paddington and the 2.0 p.m. from Worcester to Paddington cease to run. Fastest times between Paddington and Bristol are now 2¼ hours, Birmingham 2½ hours, Cardiff 3 hours, Exeter 3¼ hours. In the last case nearly all trains now travel *viâ* Bristol.

Principal withdrawals on the Great Central Railway main line are as follows, except that those marked with an asterisk are partially replaced or compensated for on particular sections: 10.0 a.m., London to Bradford; 4.40 p.m., London to Nottingham; *7.40 a.m., Manchester to London; *8.20 a.m., Manchester to Bristol (not south of Leicester); *3.40 p.m., Manchester to London (starts from Sheffield); 7.20 p.m., Manchester to Leicester (to Nottingham only); 1.45 a.m., Manchester to Sheffield; 10.0 a.m., Manchester to Cleethorpes; *6.50 a.m., Sheffield to London (not south of Leicester); *1.32 p.m., Sheffield to Lincoln; 2.35 p.m., Sheffield to Manchester; 1.40 p.m., Sheffield to York; 9.20 a.m., Newcastle to Barry; 9.44 a.m., Barry to Newcastle; 5.0 p.m., Bradford to London; 3.55 p.m., Bristol to Manchester; 8.10 a.m., Lincoln to Nottingham; 6.8 p.m., Nottingham to Lincoln; 10.25 a.m., Oxford to Woodford and Hinton; 1.50 p.m., Liverpool to Hull (starts from Sheffield); 6.20 a.m., Cleethorpes to Manchester; 7.50 a.m., Lincoln to Manchester; 2.55 p.m., Hull to Manchester (not beyond Sheffield); 11.30 p.m., York to Sheffield.

In connection with these withdrawals, the 8.20 a.m. from Manchester runs to London instead of to Bristol, and several trains make additional stops, besides being decelerated. Thus the famous 2.40 a.m. newspaper express is now allowed 98 min. to Rugby, and reaches Sheffield at 6.4 a.m. The 8.45 a.m. and 12.15 p.m. trains reach Manchester at 1.55 p.m. and 5.24 p.m. respectively. The 3.15 p.m. is due at Leicester at 5.13 p.m., Nottingham at 5.42 p.m., Sheffield 6.34 p.m., and Manchester 7.55 p.m. The 6.20 p.m. express leaves at 6.10 p.m. for Bradford, and is allowed 2 hrs. 8 min. to Leicester, with a stop at Woodford and Hinton. The 2.15 p.m. up train for Manchester is allowed 2 hrs. 1 min. from Manchester to London (due 6.51 p.m.), with stops at Woodford and Brackley. There are now no luncheon cars on the 7.35 a.m. from Nottingham to London and the 12.30 p.m. Manchester to Cleethorpes.

In the London area a number of suburban trains are withdrawn or altered. The Great Central Railway takes a rather larger share of the joint line traffic *viâ* Gerrard's Cross



Photo] [*P. L. C. Essex.*

FRESHWATER, YARMOUTH AND NEWPORT RAILWAY.
Train at Freshwater, Isle of Wight.

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than the Great Western Railway, and a rather lesser share with the Metropolitan Railway on the Harrow route. In both cases, where trains of each company were booked close together, the tendency of the alterations is to displace one altogether, though it has been necessary to allow for the fact that the volume of travel has prevented very much being done in this way. A number of local trains are withdrawn in the Nottingham, Sheffield, and Manchester districts, and the services between Guide Bridge, Ashton (P.P.), Dukinfield, and Stalybridge, and between Guide Bridge, Ashton (O. Rd.), Park Bridge, and Oldham (Clegg Street and Glodwick Road), are entirely suspended. There are also withdrawals on various sections, and a number of minor alterations, while various through carriages are no longer provided.

On the London, Brighton and South Coast Railway eighteen trains are cut out of the week-day service between London and Brighton. Six trains from Victoria or London Bridge to Brighton are discontinued, and twelve from Brighton to London. Seven trains from London to Worthing, and two trains from Worthing to London are also withdrawn. Curtailment of the suburban services has been chiefly applied to the Sunday trains. On week-days only thirty-three are to be discontinued. These include five from London Bridge to the Crystal Palace *viâ* Sydenham, and five from the Crystal Palace to London Bridge. Other services affected are those to Coulsdon and Dorking. On Sundays ninety-five trains cease to run. The service of electric trains between London Bridge and the Crystal Palace *viâ* Tulse Hill is entirely suspended, and a number of trains *viâ* Sydenham are also cut out. Most of the trains discontinued are those running to and from London Bridge. The services from Victoria have not been seriously interfered with. On week-days and Sundays the whole of the trains and motors between Streatham and Wimbledon are discontinued, as also certain other motor services in the suburban district. In numerous instances trains make extra calls at intermediate stations, thus giving a service from those stations in place of services discontinued.

The "Southern Belle" expresses have gone for the time being, and such of the Pullman cars as remain on other trains have their supplements raised, 1s. to 1s. 6d. first class, and 9d. to 1s. third.

The South Eastern and Chatham Railway have withdrawn a number of trains, and closed the Bexhill, Nunhead–Crystal Palace and Nunhead–Greenwich Park branches.

On the London and South Western Railway restaurant cars have been withdrawn from the 12.0 noon Portsmouth–Waterloo and 6.40 p.m. Waterloo–Portsmouth trains. On Sundays they are no longer run on the 12.0 noon from Waterloo to Bournemouth West, and the return train at 6.23 p.m. Trains withdrawn include the 10.15 a.m. Bournemouth West to Birkenhead, and the corresponding train from Birkenhead at 9.45 a.m., and the following trains from Waterloo: 5.15 a.m., Portsmouth; 6.0 a.m., Southampton; 6.10 a.m., Salisbury; 9.10 a.m., Portsmouth (Mondays only); 10.30 a.m., Bournemouth West; 11.35 a.m., Southampton; 1.30 p.m., Southampton; 2.10 p.m., Weymouth; 7.13 p.m., Portsmouth. Also, corresponding trains, including the 11.5 a.m. and 2.45 p.m. up trains from Portsmouth, and the 11.15 a.m. and 3.10 p.m. from Southampton. The 10.15 a.m. from Waterloo is discontinued between Waterloo and Eastleigh; the 2.0 p.m., Bournemouth, makes further stops. There are also many local withdrawals, and a number of trains make additional stops. Some of the withdrawals are practically compensated for by altered and new trains.

On the Waverley route of the North British Railway the 9.15 a.m. from Edinburgh is the only one left with restaurant cars, and that takes 2 hrs. 45 min. to Carlisle, with four stops. The 2.20 p.m. becomes a stopping train after Galashiels. The 6.0 p.m. takes 2 hrs. 42 min., with four stops, while the 9.45 p.m. is allowed 2 hrs. 45 min., with three stops. From Carlisle the 4.55 a.m. reaches Edinburgh at 7.42 a.m., with three stops, the 1.0 p.m. takes 3 hrs., with seven stops, and the 5.0 p.m. 2 hrs. 46 min., with five stops.

North of Waverley, the principal trains are: 5.0 a.m., first stop Dundee 6.28, due Aberdeen 8.49 a.m. (sleeping car train from King's Cross); 8.15 a.m. (several stops), through express from St. Pancras to Dundee and Aberdeen; 9.32 a.m. semi-fast to Dundee and Montrose; 2.10 p.m., Kirkcaldy, Dundee, Arbroath, Montrose, Stonehaven and Aberdeen; 5.2 p.m. semi-fast to Dundee and Montrose; and a fair selection of other trains covering portions of these routes. Returning, expresses or semi-fasts leave Montrose for Edinburgh at 10.28 a.m., Aberdeen 12.30 p.m. and 5.0 p.m. (through to St. Pancras), Montrose 6.29 p.m., and 8.5

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p.m. through to King's Cross (restricted to passengers for Newcastle and south thereof).

From Edinburgh to Perth there is only one Highland express (9.50 a.m.), with two from Perth (3.30 and 7.55 p.m.). From Glasgow to Edinburgh the principal business expresses are not decelerated. They leave at 7.45, 9.5 a.m., 1.0, 2.10, 4.0, 5.0 and 9.0 p.m., with returns from Waverley at 7.40, 9.7, 10.6 a.m., and 1.0, 2.5, and 4.8 p.m., most of the other trains being slow or semi-fast. On more remote branches the train services are reduced from four or three to three and two trains each way daily ; and there is only one through service from Glasgow to Mallaig, though two returning are available. Traffic on the Waverley–North Leith and Granton routes is suspended, also the boats between Burntisland and Granton.

In regard to the Caledonian Railway the 10 a.m. from Glasgow (Central) becomes a connection with the 8.50 a.m. *ex*-Perth, while the old 2 p.m. leaves at 1 p.m., joining the 11.40 a.m. from Perth at Carstairs, and having no Edinburgh connection. The 4.45 p.m. joins the Perth train at Law Junction. The 9.45 p.m. is the only non-stop to Carlisle (due 12.20 a.m.), while the 10.10 p.m. is the late train for the South. Going northwards the 2.30 a.m. *ex*-Carlisle is due at Perth at 6.25 a.m. ; the 4.45 a.m. is also for the Perth road, but makes several calls ; the 5.2 a.m. is due Glasgow at 7.50 a.m. with 3 stops, and the 7.10 a.m. is non-stop to Glasgow Central, due 9.40 a.m. The 1.45 p.m. is a semi-fast, with the Perth portion detached at Motherwell, and the 4 p.m. (9.30 a.m. *ex*-Euston), divides at Carstairs, due Perth 8.20 p.m., Edinburgh 7.21 p.m. and Glasgow Central 7.10 p.m. The 8.20 p.m. (1.15 p.m. *ex*-Euston), divides at Beattock, and is due Glasgow Central 11.5 p.m., Edinburgh (detached from the Perth section at Carstairs) 11.15 p.m., and Perth 12.51 a.m. On the Aberdeen route the only really fast train is the Limited Mail. The old 10 a.m. from Buchanan Street leaves at 9.45 a.m., the 2 p.m. at 1.30 p.m., while the 6.5 p.m. and 10 p.m. (a fairly good train even as altered), with the 7 a.m. are the only other through trains from Glasgow to Aberdeen. Returning, the 6.10 a.m. from Aberdeen is for Glasgow, Edinburgh, and the South ; as also the 9 a.m., except that the connection to Edinburgh is to Waverley *viâ* Larbert ; the 12 noon is for Glasgow and the South ; the mail leaves at 2.40 p.m. and continues to call only at Forfar and Perth, the Glasgow portion being due at Buchanan Street 6.30 p.m. ; the 5.30 p.m. is a fairly good train, due Glasgow Central 10 p.m., and the 6.45 p.m. is for the South and for Glasgow 11.30 p.m. As the Edinburgh–Glasgow express service is entirely North British, there are now only 8 or 9 Caledonian stopping trains on their route. Coast services are suitably divided between the Caledonian and Glasgow and South Western Railways.

On the Glasgow and South Western Railway only three expresses remain between Carlisle and Glasgow. By the 2.35 a.m. *ex*-St. Pancras the service north of Carlisle is a slow one ; the 9.15 a.m. from St. Pancras (dining car train) leaves Carlisle at 4.25 p.m. and reaches St. Enoch at 7.20 p.m. From some English stations and connections it does not convey passengers beyond Kilmarnock, except for Clyde coast stations. The 9.15 p.m. from St. Pancras (sleeping cars) leaves Carlisle at 5.10 a.m. and reaches Glasgow at 8.10 a.m. This has connections south of Carlisle from certain towns wherefrom passengers are not taken from Glasgow itself. Up trains leave St. Enoch at 9.15 a.m. (restaurant cars for London), 4.30 p.m. (for Leeds, and Bradford, for Glasgow and Manchester, Liverpool, Birmingham and Bristol from Kilmarnock, etc.), and 9.15 p.m., sleeping cars for London. There are various restrictions upon the towns to or from which passengers can travel, carrying out the policy of distributing traffic as already set forth. The Stranraer service leaves Stranraer Harbour at 9.35 p.m. and reaches Carlisle at 12.45 a.m. The suburban and Clyde coast routes still maintain good services, though modified and to some extent reduced.

Great Eastern Railway Train alterations came into force on January 15th. No further stations are closed, but the only restaurant cars remaining in service are those on the 10.0 a.m. and 5.23 p.m. Liverpool Street–Cromer train, 12.0 noon to Hunstanton, 8.15 a.m. to Norwich, and 7.45 p.m. to Lowestoft, with the following up trains : 7.53 a.m. and 5.30 p.m. Cromer to Liverpool Street, 9.2 a.m. Lowestoft to Norwich, continuing at 10.48 a.m. to Liverpool Street *viâ* Ely, 1.10 p.m. Norwich to Liverpool Street, and 4.45 p.m. Hunstanton to Liverpool Street.

Several express trains make additional calls to replace connecting and feeding trains withdrawn, and there are numerous instances where of two trains close together, one is altered and the other taken off. Principal down Colchester line trains affected are :

5.0 a.m. Norwich. Further calls

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5.9 a.m. Ipswich. Withdrawn.
7.56 a.m. Colchester. Withdrawn.
8.30 a.m. Norwich. Starts at 8.15 a.m., makes further calls. Yarmouth connection discontinued.
9.50 a.m. Colchester. Withdrawn.
10.15 a.m. Norwich. Starts at 10.0 a.m. Further stops.
11.51 a.m. Witham and Braintree. Starts at 11.10 a.m. in connection with 11.38 a.m. (altered 11.42 a.m.) Ipswich.
12.57 p.m. (Sats.). Discontinued south of Ipswich, and thence becomes connection with 12.30 p.m.
4.55 p.m. Yarmouth. Discontinued south of Ipswich, and becomes connection thence with 5.23 p.m. Cromer.
7.13 p.m. Harwich. Withdrawn.
7.45 p.m. Yarmouth. Makes further calls.
11.0 p.m. Chelmsford. On Saturdays goes on to Colchester.
12.5 p.m. (Colchester and Clacton, Sats. only). Withdrawn.

These and associated alterations show the general features of the changes, while certain other trains are also modified in various ways. On the Cambridge line the changes of principal interest are :

5.13 a.m. Norwich. Starts from Cambridge.
8.40 a.m. Norwich. Starts at 8.35 a.m. Altered.
9.10 a.m. Continued to Ely (connection on Tuesdays, Kings Lynn).
9.57 a.m. Cambridge. Withdrawn.
10.30 a.m. St. Pancras to Norwich. Withdrawn.
12.50 p.m. (not Sats.). New train, Liverpool Street to Cambridge.
1.41 p.m. (not Sats.). Withdrawn.
2.35 p.m. Norwich. Makes additional calls.
3.55 p.m. St. Pancras to Norwich. Withdrawn.
4.50 p.m. Ely. Ceases to convey Broxbourne and Hertford passengers.
5.13 p.m. Withdrawn to Cambridge.
5.17 p.m. Extended to Cambridge and makes further calls.
7.2 p.m. Starts at 6.30 p.m., and makes additional stops.
8.10 p.m. Cambridge. Starts at 8.20 p.m. Altered.
8.58 p.m. Cambridge and Bury. Withdrawn.

There is no need to deal with these in detail, nor to review corresponding up alterations, but there are many incidental changes and a few further reductions in connections and on branches. On the whole, however, Great Eastern main line and country reductions are by no means so serious as on certain other lines.

A few of the Southend trains are altered so that where a branch train is run in connection with a fast through train the former can be dispensed with, and there are a few withdrawals, but the more important business trains remain much as hitherto. Trains to York for the most part terminate at Lincoln or Doncaster.

In the suburban district the week-day changes are not very drastic. A number of trains are withdrawn and others altered, but traffic is too heavy for many reductions being made, except at slacker periods. Principal items calling for note are alternate trains on the "all-night" Walthamstow service, so that trains run hourly instead of half-hourly; reductions during the quieter hours of the day on various routes; withdrawal of 8.28 p.m. (8.25 p.m. Sats.) Fenchurch Street to Ongar and 9.35 p.m. Fenchurch Street to Loughton; and half-hourly trains between Fenchurch Street, Blackwall and North Greenwich.

On Sundays the whole of the local services are revised, giving generally hourly trains on the respective routes. All Fenchurch Street trains to the Loughton line are withdrawn.

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Railway Staff Changes: January, 1917.

THE turn of the year always produces a number of changes in railway official *personnel*, and several of these now have to be placed on record. The first is the retirement, under the age limit, of Mr. John Black, Superintendent of the Line, North British Railway. After a service of 46 years, Mr. Black, who for seventeen years filled the position of Assistant Superintendent, was appointed Superintendent of the Line, in September, 1911. Starting as an apprentice booking clerk at Portobello station in 1865, he successively filled the positions of Relief Agent and North British Stationmaster at Bridge of Allan, until called to headquarters in 1873 to fill a post in the passenger train working department under Mr. Maclaren, then General Superintendent. Afterwards he occupied various positions in the Superintendent's office, and played an important part in carrying out many schemes for the better working of the line. For fifteen years before his appointment as Deputy Superintendent of the Line, he had charge of the Staff Department; and, under the direction of the Superintendent, carried through all appointments and promotions of the general staff.

To a Scottish newspaper Mr. Black has contributed some interesting reminiscences, a few of which may be reproduced. In his early days there were still in existence in certain sections open, uncovered wagons without seats, where passengers stood crowded together during the journey. These carriages were principally in use for the transport of bodies of Irish labourers on the Glasgow and Helensburgh line. Cheap fares and holiday travelling were unknown, except in the case of the Irish labourers, who travelled at special rates.

Just about this time the Royal Border Bridge had come into being. Previous to its erection the Berwick to Tweedmouth journey had to be done by coach. There were at this period many single lines, worked on methods of extreme simplicity. Trains were worked on a time interval instead of a space interval. Signalling was carried out, not by the familiar apparatus of the modern railway lines, but by vanes.

The erection of Waverley station, Edinburgh, was a revolution in railway development. The present generation cannot imagine what the Waverley Bridge area was like in those early days. The booking offices, it may be mentioned, were on the level of Princes Street, and the present-day cab ranks within the confines of the station formed then a part of the public street. The line to the north was from Edinburgh through Perth and Dundee by way of the Scotland Street tunnel (which still exists), through which the trains were hauled by a cable. Soon after Mr. Black joined the service, the Edinburgh and Glasgow lines amalgamated with the North British Company. There were no refreshment rooms on the system half a century ago. Mr. Rowbotham was the General Manager in those early days, and the stationmaster in Edinburgh was Mr. Lingard.

With the retirement of Mr. Black the title of Superintendent of the Line disappears. Instead, two separate departments have been constituted. These are designated Commercial and Operating respectively. For the post of Commercial Superintendent, Mr. William Strang, Chief Assistant to Mr. Black, has been appointed; while Mr. Charles Herbert Stemp, Outdoor Assistant, becomes Operating Superintendent.

The Commercial Superintendent is responsible for the fixing of rates and fares, for the settlement of claims, and for the development of coaching traffic, etc. The booking, parcel, season ticket, and other inside staffs are also under his direction. To Mr. Stemp, as Operating Superintendent, falls the supervision of, *inter alia*, the timing and running of all descriptions of trains, distribution of stock, preparation of public and working time-tables, equipment required for trains, new coaching stock, new works, signalling, etc. The outdoor staff in the traffic department is under his control; while he also deals with naval and military movements, as far as railway working is concerned.

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MR. HENRY WORTH THORNTON.
General Manager, Great Eastern Railway.
Appointed also Engineer-in-Chief, January 1st, 1917.

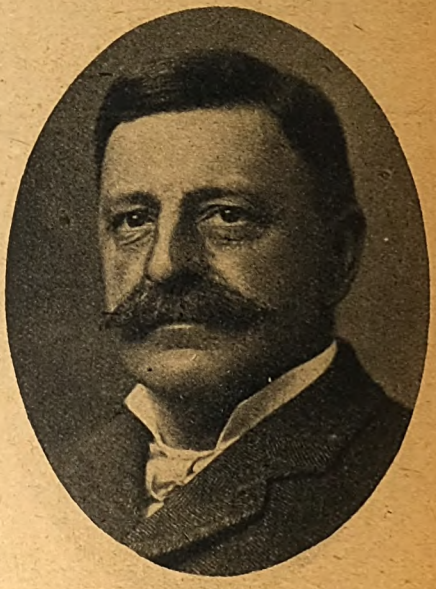
Stationmasters who deal with business pertaining to both commercial and operating departments are under the joint supervision of the Commercial and Operating Superintendents; but present methods of making up paybills are adhered to, as also the present arrangement under which stationmasters and others communicate with the respective district officers in regard to the ordinary business of the Company.

Mr. Strang is a native of Fife, where he gained his early experiences of railway working. For some years he was Parcels Agent at Edinburgh (Waverley), the largest parcels depôt on the system, from which position he was promoted to be District Traffic Superintendent at Burntisland. On Mr. Deuchars' retirement from the post of Superintendent of the Line, he was chosen to become chief assistant to the Superintendent, Mr. Black, who, as already stated, now retires from the service.

Mr. Stemp is a native of Cambridge, and entered the service of the Great Eastern Railway some 32 years ago, passing through various grades. In 1907 he went to the North British Railway as train working assistant to Mr. Deuchars, and on Mr. Deuchars' retirement he was appointed Outdoor Assistant to the Superintendent of the Line.

In consequence of the retirement of Mr. Horace Wilmer, Chief Civil Engineer, Great Eastern Railway, who becomes Consulting Engineer to the Company, Mr. H. W. Thornton, General Manager, combines the position of Engineer-in-Chief, taking control of the department, with Mr. John Miller as his chief assistant in this department.

Mr. S. A. Parnwell, F.S.I., A.A.I., Assistant to the General Manager, Great Eastern Railway, and Land Agent, has been appointed Secretary and Comptroller to the Great Eastern Railway, in place of the late Mr. Powis Lomas. Mr. Parnwell was born in 1880, and was educated at the City of London School and the Huntingdon Grammar School. He entered the office of Messrs. Dilley, Son and Read, auctioneers, of Huntingdon, where he gained the experience of an agricultural auctioneering practice for two years. He then came to London and was



MR. H. WILMER.
Retired Chief Engineer,
Great Eastern Railway.

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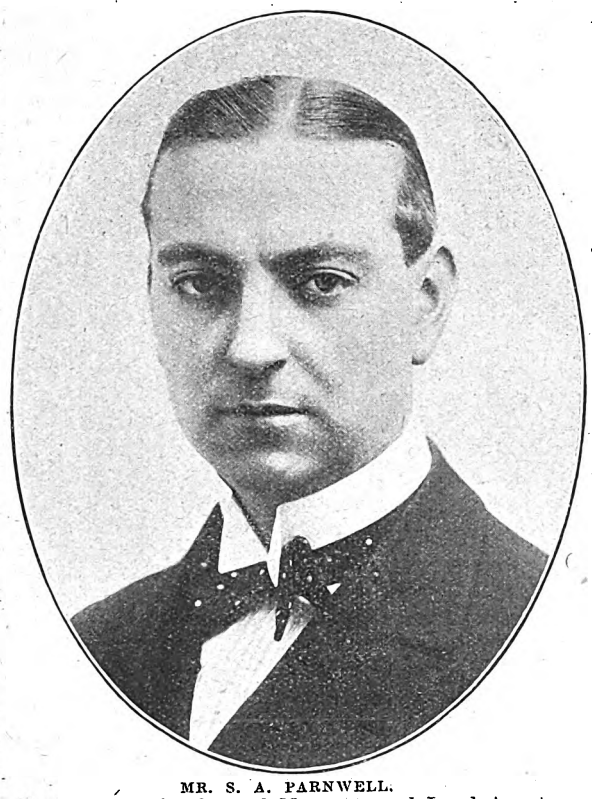
articled to Mr. Daniel Watney, senior partner of the firm of Daniel Watney and Sons, land agents and surveyors, remaining there for four years. During this period he passed the preliminary, intermediate, and final examinations of the Surveyors' Institution. Later he joined the staff of Mr. W. H. Elwell, Surveyor to the Great Northern Railway, and upon that gentleman's retirement, acted as assistant to his successor, Mr. A. J. Brickwell, subsequently becoming chief assistant in that department. In January, 1909, when the office of Land Agent on the Great Eastern Railway became vacant, Mr. Parnwell was appointed to fill the position at the comparatively early age of twenty-nine. In April, 1915, Mr. Parnwell was appointed assistant to the General Manager, retaining, however, his duties as Land Agent.



MR. S. A. PARNWELL.
Assistant to the General Manager, and Land Agent, Great Eastern Railway.
Appointed Secretary and Comptroller, *vice* Mr. Powis Lomas, deceased.

We regret the death of Mr. Powis L. Lomas, J.P., Secretary and Comptroller, Great Eastern Railway, from pneumonia, following a few days' illness. Joining the Company in 1879, he became Assistant Secretary in 1907, and Secretary three years later. Coincident with the reorganisation carried out in 1915, the scope of Mr. Lomas's department was extended and his official title was altered to that of Secretary and Comptroller. Taking service with the Company at the time when the Superannuation Fund for providing retiring allowances for the salaried staff was established, and when the Provident Bank and Accident Fund was instituted, he subsequently took a very prominent part in the inauguration of the Guarantee Fund, as well as the Pension and Pension Supplemental Funds, established in the interest of the wages staff. It was upon his advice that the Directors of the Company chiefly acted when the "contracting-out" schemes, under the Workmen's Compensation Acts of 1897 and 1905, were carried into effect. The wide experience gained by Mr. Lomas in connection with the working of the Great Eastern Railway Provident, Superannuation and other funds, led to his giving evidence before a Royal Commission which sat some time ago on

THE LATE MR. POWIS LOMAS.
Secretary and Comptroller, Great Eastern Railway.

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Civil Service Pensions, and, more recently, he was requested to attend before the Commission appointed to inquire into the Railway Superannuation Funds generally.

Although Mr. H. W. Thornton came in 1914 from the United States, barely three years ago, he has already made his mark and taken his place among Great Eastern staff as one of themselves, respected by his departmental colleagues and by the board, as well as by the ordinary members of the staff. He entered the service of the Pennsylvania lines west of Pittsburgh in December, 1894, and in 1895 was appointed assistant engineer on the construction of the Cleveland and Marrietta Railroad, one of the subsidiary lines of the Pennsylvania Company. In 1899, Mr. Thornton became Engineer for Maintenance of Way on the Erie and Ashtabula division, and on March 1st, 1901, he was made Superintendent of the Marrietta division of the Cleveland and Marrietta Railroad. In May, 1902, he was appointed Superintendent of the Cleveland, Akron and Columbus Railroad, and on December 23rd, 1902, was transferred to the Erie and Ashtabula division. On February 1st, 1911, he was appointed Assistant General Superintendent of the Long Island Railroad, and on November 14th, 1911, he was advanced to the post of General Superintendent. In February, 1914, he was selected by the directors of the Great Eastern Railway to follow Mr. W. H. Hyde as General Manager. Since then Mr. Thornton has taken his share in the special work necessitated by the war, and he has been added to the Railway Executive Committee, besides receiving an honorary commission in the Railway Engineering and Staff Corps.

MR. W. H. STANIER.
Late Assistant to the General Manager, Great Western Railway.

Mr. Horace Wilmer, M.Inst.C.E., succeeded Mr. Harry Jones as Chief Engineer, Great Eastern Railway, in 1915. He was educated at Rugby School, and in 1871 passed into the Indian Civil Engineering College, Coopers Hill, and was appointed in 1874 Assistant Engineer 2nd grade in the

MR. C. ROBERTS.
Goods Manager, Swansea District, Great Western Railway.

MR. W. E. JAMES.
Assistant Goods Manager, Swansea District, Great Western Railway.

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Indian Public Works Department. He was employed for two years under Col. Sankey, R.E., in works of irrigation in the province of Mysore, but returned to England in 1876, entering the service of the Great Eastern Railway in May, 1877. In 1882 he was appointed Engineer of the Southern Division and remained in charge of this division until becoming Chief Civil Engineer for the system.

Mr. Leonard Sydney Smith has been appointed superintendent of hotels. Mr. Leo Horne, who has for some time been deputising in that capacity, returns to the Continental department.

Mr. Fred. W. Searle, of Penzance, has been appointed Great Western Railway Goods Agent at St. Davids, Exeter, and Alphington Road stations. Mr. Searle joined the old West Cornwall Railway in 1878, and at stages of his career became successively booking clerk and chief goods clerk. In 1908, upon the closing of the District Superintendent's and Goods Manager's offices at Penzance, was appointed Goods Agent. He is succeeded by Mr. Morris, Goods Agent at Waterford.

Mr. William Henry Stanier, Assistant to the General Manager, Great Western Railway, retired from this position on December 31st. He had been in the service since November, 1864, when he entered the office of the late Mr. W. Dean, at the Locomotive Works at Wolverhampton. In April, 1871, Mr. Stanier was transferred to Swindon, and from that date until June, 1892, occupied a responsible position in the office of the Chief Superintendent of the Locomotive and Carriage Department. He was also engaged in the development of the modern system of inspecting and testing materials, and the first chemical laboratory on the railway was established under his supervision. In June, 1892, Mr. Stanier was appointed Stores Superintendent, and held that position until January, 1915. In the spring of 1914, Mr. Stanier visited the United States and Canada, and met many of the leading railway storekeepers of America. As a result of this visit, an Association of Stores Superintendents of English Railways was founded in 1914, of which Mr. Stanier was appointed first President. In January, 1915, Mr. Stanier was transferred to Paddington, as an assistant to the General Manager. While resident at Swindon, from 1871 to the end of 1914, Mr. Stanier took an active part with organisations for the benefit of the railway staff. We understand that Mr. Stanier is not severing altogether his connection with railway work, as he is for the present being engaged on work for the Railway Executive Committee.

Mr. Lewis Edward Trickey, District Goods Manager, Great Western Railway, at Swansea, retired at the end of the year. He entered the service of the Great Western Company in 1868 as a clerk in the Gloucester Goods Office, and in 1870 was transferred to the District Goods Manager's office at Gloucester. In 1876, he was appointed as Chief Clerk there. He was subsequently appointed stationmaster at Lydney, and in 1879 was promoted to Chief Clerk to the District Goods Manager for the Swansea district. In July, 1900, Mr. Trickey was appointed Goods Manager for the Swansea district.

Mr. Charles Roberts has been appointed by the Directors to succeed Mr. Trickey as Goods Manager for the Swansea district. He entered Great Western Railway service in 1884 in the then District Superintendent's and Goods Manager's office at Llanelly. Five years later he was transferred to Paddington and joined the staff of the General Manager. He remained there nearly fourteen years, and in December, 1902, was appointed Goods Agent at Bath. In 1907 he went to Bristol as Assistant Goods Superintendent, and in 1910 was transferred to Swansea as assistant to Mr. Trickey.

Mr. William Edward James, who succeeds Mr. Roberts as Assistant Goods Manager, is a son of the stationmaster at Baschurch. He entered the Company's service in 1881 as a lad clerk at Wrexham goods station, where he attained to the position of Chief Clerk. In 1902 he was promoted to be Goods Agent at Saltney, and five years later was transferred to Croes Newydd station, with the oversight of the goods department interests in the Brymbo, Minera, and Moss districts. In 1913 he was appointed Assistant Superintendent at Paddington goods station, and in the following year went to Swansea as Chief Clerk to the District Goods Manager.

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British Railway Service and the War. [X.]

SIR SAM FAY, General Manager, Great Central Railway, has been appointed to the control of military and munition train movements in this country, in connection with the Department of Military Railways, of which Sir Eric Geddes is the Director-General, and Sir Guy Granet Deputy-Director-General. The change will secure complete co-ordination of the railway military transport work at home and at the front.

Mr. E. A. Prosser, General Manager, Rhymney Railway, has been appointed Deputy Director of Military Train Movements at the War Office, under Sir Sam Fay.

Sir Sam Fay commenced his railway and business career as a Junior Clerk in the Traffic Department of the London and South Western Railway in 1872. In 1884 he was removed to the Traffic Superintendent's Office at Waterloo as second Clerk, and ten months later appointed Chief Clerk to the Superintendent of the Line. He remained in this position till 1891, when he was appointed Assistant Storekeeper. In 1892 he left the London and South Western Railway to be General Manager of the Midland and South Western Junction Railway. This position he held until his return to the London and South Western Railway, as Superintendent of the Line in April, 1899. In March, 1902, he became General Manager of the Great Central Railway. He was elected Chairman of the General Managers' Conference of the Railway Clearing House for 1911. On the occasion of the opening of Immingham Docks by His Majesty the King in July, 1912, a knighthood was conferred in recognition of his services. Sir Sam Fay is a member of the Advisory Committee on railway subjects at the London School of Economics. He is a member of the Railway Executive Committee.

Mr. Prosser joined the Rhymney Railway in 1881, and passed through all departments, until appointed Deputy General Manager. For many years he was Mr. Lundie's right-hand man, and as Mr. Lundie held the triple position of General Manager, Engineer and Locomotive Superintendent, his experience was varied, and valuable, and rendered his selection to be General Manager, succeeding Mr. Lundie, a highly judicious one. Mr. Prosser had charge of the revision of the Rhymney Railway's charges under the Rates and Charges Order Act of 1892, and after that year assisted Mr. Lundie in Parliamentary work at Westminster.

Mr. W. Clow, Superintendent of the Line, Great Central Railway, has joined the staff of Sir Eric Geddes, with the rank of Major in the Royal Engineers. Mr. Clow entered the service of the Midland Railway in 1878, and remained with that company in various grades for seventeen years, the last seven of which were spent on the relief staff. In 1895 he left to join the Midland and South Western Junction Railway, where he stayed seven years, during which period he had charge of traffic working, as well as of the stores and stationery. In 1902 he entered the service of the Great Central Railway as Outdoor Assistant to the General Manager, was promoted to the position of Assistant to the Superintendent of the Line in 1903, and appointed Assistant Superintendent of the Line, 1905. In 1910 he succeeded Mr. Haig Brown as Superintendent. Mr. Clow was Chairman of the Superintendents' Conference of the Railway Clearing House, 1914.

In the course of an appropriate New Year article published by the *Great Western Railway Magazine* the Editor remarks: "What the railways—and not least amongst them, the Great Western—have done towards making the war preparations efficient, and in helping to keep things moving at the Front, will, perhaps, never be fully recorded, but if the figures showing either the volume of traffic handled or the quantity of war munitions manufactured were published, they would be very illuminating. What has been achieved in many directions by the railways could not have been accomplished except by the whole-hearted and loyal effort of all sections of the staff of which it is impossible to speak too highly. This co-operation and loyalty will certainly have to be continued in the year upon which we are entering, and probably all through the year. The efforts of the past will not have to

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be slackened in any way, just as the sacrifices of the country will also have to continue until the victory for which they are made is accomplished."

The Traffic Department of the Great Western Railway has furnished 550 members of its staff for service with His Majesty's Forces during the year 1916, making a total of 3,075 (equivalent to 16 per cent.) released since the outbreak of war. An increased number of women and girls have temporarily replaced a proportion of the men, and there are now 1,326 employed in various positions.

During the past year passenger and goods trains have been heavier in weight and loads than normally, a very large number of Service men and heavy Government freight traffics having had to be provided for. Something like 14,500 "special trains" were run for the conveyance of troops and munitions of war.

The work of the Great Western Railway Goods Department has been very heavy during the past twelve months, mainly due to the passage of war material in addition to the ordinary merchandise of the country. The staff has been greatly depleted by enlistment, as many as 1,754 members, or 19 per cent. of the wages staff, and 778, or 27 per cent. of the clerical staff, having joined the Forces.

The number of Locomotive, Carriage and Wagon Department men now serving with the Colours totals upwards of seven thousand. So far as the clerical staff is concerned vacancies have been filled by females, who now number over 300.

In connection with the establishment of a Food Control department of the Board of Trade, Mr. Arthur Towle, Manager of the Hotels, Restaurants, and Refreshment Rooms of the Midland Railway, has been lent by the Company. He is an exceedingly capable man, who learned his business under the tuition of his father, Mr. W. Towle. He has a thorough knowledge of the whole catering business. Mr. Towle's brother, Mr. Frank Towle, who before the war was co-manager in the Midland Railway refreshment department, has been working at the War Office for some time in connection with canteens. Portraits of both Mr. Arthur and Mr. Frank Towle appeared, in connection with a special article dealing with their department of Midland service, in the RAILWAY MAGAZINE for April, 1916.

In a New Year message to London and North Western Railway men serving with the colours, and to the staff remaining at home, Mr. Guy Calthrop, General Manager, writes: "I wish to send a New Year's greeting to all North Western men who are in one way or another engaged on land or sea, in helping Great Britain and her Allies. I look forward to the time when I can welcome you back to the Railway service. I also send a hearty greeting to all those members of the staff who, for one reason or another, remain at home and thank them all for the good work they are doing under most difficult circumstances."

Total war casualties reported amongst London and North Western Railway men now amount to 5,761, made up as follows:—

Killed in Action, Drowned, etc. ..	782	1,302
Died from Wounds, etc.	375	
Missing and Presumed Dead ..	145	
Missing	108	
Wounded, Sick, etc.	4,150	
Prisoners of War	201	
	5,761	

Out of the 4,150 men shown above as being disabled, 2,911 have now returned to their military duties.

Lieut. Sidney Carman Saward, Royal Engineers, a younger son of Mr. Frank Saward, Cartage Manager to the Great Eastern, Great Northern and Great Central Railways, has been decorated by H.M. King George with the Military Cross, for conspicuous gallantry on the Somme front, where he was wounded. For distinguished conduct he had previously been awarded the Military Medal.

Lieut. Saward joined the staff of the Land Agent's Department of the Great Eastern Railway as a draughtsman in 1906, qualified for the Professional Associateship of the Surveyors' Institute in 1910, and for the Fellowship in 1911.

He then left the service of the Great Eastern Railway, and secured an appointment with the Canadian Northern Railway and was engaged on important pioneer constructional work. Upon the completion of the work, he left the Canadian Northern Railway and joined the staff of the Chief Engineer of the Great Central Railway of England. Upon the outbreak of war he immediately volunteered, and earned his commission in his regiment of Royal Engineers by hard work and practical initiative.

It has been decided that a wing shall be added to a Cottage Hospital to be erected at Dovercourt, as a useful and perpetual memorial to the late martyr, Captain Charles Algernon Fryatt. This is to be called "The

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Fryatt Memorial Wing." An appeal is now being made for the necessary funds, and subscriptions may be sent to the Mayor of Harwich, to Mr. C. Busk, Great Eastern Railway, Continental Traffic Manager, Liverpool Street station, or to Captain Chilver, Acting Marine Superintendent, Parkeston Quay.

Lance-Corporal William Albert Morgan, of the Yorkshire Regiment, who was employed as a porter at the Stores Department, Nine Elms, London and South Western Railway, prior to his enlistment in August, 1914, has been awarded the Military Medal. On July 5th, when the Horseshoe Trench and its vicinity were being heavily shelled by the enemy, after its capture, Lance-Corporal Morgan laid a telephone wire to the battalion headquarters under heavy fire in the open, and four times went out to repair it during bombardment. Unfortunately he did not return to the trench after the fourth attempt, and up to the present nothing definite can be ascertained as to what became of him. He is officially reported as "Missing," but as he was acting as company-signaller with a Captain Dodgeson, who is also missing, there is every reason to fear that both were killed by a shell which was seen to burst near them.

In the early days of the war Mr. Edwin Waldegrave Packer-Taylor, from the Chief Mechanical Engineer's Department at Eastleigh, London and South Western Railway, joined, as a private, the Universities' and Public Schools' Force. In January, 1915, he was given his commission in the Mechanical Transport Division of the Army Service Corps, a branch of the Service which affords wide scope to men of practical experience. In the July following he proceeded to France, gaining promotion a few months later, and has recently had conferred upon him a special appointment as Workshop Officer in France.

The following is a list of members of the staff of the Great Central Railway who have been decorated for Distinguished Conduct, or who have been Mentioned in Dispatches, and reported to the Officers of the Company.

Chief Accountant's Department.—J. C. Frawley, clerk, Manchester—Military Medal.

Audit Accountant's Department.—H. Cooke, clerk, Manchester—Promotion to Company Sergeant-Major for conspicuous gallantry in the field.

Chief Goods Manager's Department.—C. S. Miller, clerk, Leicester Goods—Military Medal; James Austin, goods porter, New Holland—Military Medal.

Chief Mechanical Engineer's Department.—C. Flower, engine cleaner, Sheffield—D.C.M.; J. Rowlinson, crane driver, Gorton Works—D.C.M.; G. W. Jarvis, labourer, Gorton Works—D.C.M.; F. Hill, spare fireman, Sheffield—Military Medal.

Electrical Department.—S. Ainsworth, technical assistant, Marylebone—Mentioned in Dispatches.

Engineer's Department.—S. Prior, foreman carpenter, Marylebone—D.C.M.; W. J. Hill, ganger, Marylebone—Mentioned in Dispatches; E. Garnett, officeman, Marylebone—Military Medal; W. Dormer, platelayer, Akeman Street—Military Medal; F. Saward, draughtsman, Marylebone—Military Cross; Military Medal.

Portmaster's Department.—H. B. Boothby, outdoor assistant, D.S.O.; C. V. Crossley, chief officer, D.S.C.; W. G. Wood, captain, Mentioned in Dispatches.

Superintendent's Department.—L. Askew, shunter, Sheffield—Military Medal; E. Catherall, shunter, Connah's Quay—D.C.M.; J. Grainger, car conductor, Immingham—Military Medal; R. T. Pickworth, clerk, Leicester—Military Service Medal; C. D. Taylor, goods guard, Gainsboro'—D.C.M.; H. Wheeler, porter, Quainton Road—Military Medal; G. Whitfield, clerk, Culcheth—Name noted for conspicuous gallantry in the field; R. Williams, porter, Caergwrle Castle—D.C.M.

War casualties to Great Central men, reported to the end of November, 1916, are :—

Department	Killed	Missing and Wounded	Prisoners	Total
General Manager ..	1	1	—	2
Secretary	—	2	—	2
Solicitor	1	1	—	2
Chief Accountant ..	11	30	—	41
Audit Accountant ..	2	11	—	13
C. M. Engineer ..	160	279	17	456
Chief Engineer ..	70	139	12	221
Electrical Engineer	2	10	2	14
Goods Manager ..	47	110	7	164
Hotels	3	2	1	6
Mineral Manager ..	1	1	—	2
Police	2	12	—	14
Portmaster	27	44	1	72
Stores Superintendent	9	16	—	25
Traffic Superintendent	92	198	4	294
London Cartage G.C. Section ..	1	7	2	10
Messrs. Thompson McKay & Co. ..	23	81	2	106
	452	944	48	1444

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The Why and the Wherefore.

For several years a section under this title was a standard feature of the RAILWAY MAGAZINE. *During the intervening period queries have received attention in "Pertinent Paragraphs," or have been replied to by post; but the topics dealt with are frequently of wider interest, and in response to requests from many quarters, it has been decided to reintroduce the "Why and the Wherefore" pages. Queries must not, however, be of purely local application, nor can lists of engines be supplied. Readers desiring information should mark envelopes "Query" in the upper right-hand corner.*

North London Railway Locomotives.

Electrification of the Broad Street–Richmond and Kew Bridge routes has released a number of North London steam locomotives, but in view of the fact that London and North Western engines and coaches which used to work the "Outer Circle" trains from Broad Street to Mansion House (later to Earl's Court) have for some years taken some of the North London duties, and the war has seen very severe restrictions of train services over the Hampstead Junction line, the number released is not large. There is plenty of scope for London and North Western Railway engines and coaches elsewhere. At present some of the more modern "Richmond" sets of coaches have replaced older ones working on to the Great Northern Railway. New Year train services on the North London Railway release still further engines and coaches, and no doubt some of these will be used elsewhere than on their own system to meet war requirements.

[Reply to J. S. GAGE.]

Steam Locomotives and "Circle" Trains.

Before electrification all steam trains on the "Outer Rail" of the "Inner Circle" in London were Metropolitan, and these changed engines at South Kensington. An engine standing on the middle line there ran forward on to the main line as a train arrived, and the train engine was then detached and backed to the middle line in its place. The former engine then ran back to the train and worked it until South Kensington was again reached. The engine detached provided the reserve for the next Circle train and so on, each engine thus getting 10 minutes between each circuit for coaling and inspection. On the "Inner Rail" some of the trains were District, and they changed engines at High Street, Kensington, while the Metropolitan trains changed at Aldgate Main. There the replacing engine was obtained from the Hammersmith terminal bay line, so that engines became transferred from Circle to Hammersmith service or *vice versa* between journeys, unless two Circles were concerned before a Hammersmith train had to be dealt with, as a number of the Hammersmith trains ran on the New Cross route, and the Great Western Railway also took a share of those terminating at Aldgate, using the opposite bay line. These bays are now the respective through "Circle" lines, the old Central through lines being now terminal.

[Reply to J. CARLING.]

Engine Working on the Caledonian Railway.

Probably you are correct in pointing out that No. 907 has never run the 10 a.m. from Buchanan Street to Perth, and that the engine, if of the 4–6–0 class, would be No. 904 or 905. The statement was a general one, and possibly memory has caused some confusion as to the actual engines. Similarly reference to Nos. 47 and 48 should have been made to Nos. 49 and 50, the latter running the 2 p.m. *ex*-Buchanan Street to Perth, thence working to Dundee. Perth Joint station is a long way down the list of largest stations in the United Kingdom, and cannot, of course, be compared with the big London and provincial termini, though it is most important from the traffic point of view, and is always interesting. It was included in the "Notable Railway Station" series in May, 1905, but that number is unfortunately long out of print. [Reply to J. T. MOIR.]

Great Western Railway Signals in the Clapham Junction District.

Mr. W. E. Edwards writes explaining that for many years past there have been many standard Great Western semaphores in his district, for the reason that Latchmere Junction, the apex of the triangle on the up side of the London and South Western Railway towards Battersea, is included in the West London Extension Railway, and by arrangement is maintained by the Great Western Railway. Hence, travelling by down London and South Western train, a standard Great Western distant signal may be seen on the right hand side shortly after passing Queen's Road. From the West London Junction spur, on the up side, Great Western Railway signals are again observable, while another group exists close to the South Western up rails, at the point where the West London Extension lines pass under for trains from Latchmere Junction towards the West London platforms on the Brighton side of Clapham Junction. On the South Western side of the station, may be seen other Reading pattern signals for South Western trains from Clapham Junction to Addison Road.

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The Leeds-Newcastle Flyer.

The train you mention, 9 a.m. *ex*-Leeds (New) to Glasgow, used to be allowed only 82 min. for the run of 80 miles from York to Newcastle, but was later decelerated to 84 min., and latterly to 89 min., leaving Leeds at 8.55 a.m. At its fastest it was a fairly light train, as the restaurant car was not added until Newcastle. Leaving that station at 11.14 a.m. the train provided the fastest run to Edinburgh, booked in 2 hours 18 min. for 124½ miles. New Year decelerations have increased this to 2 hours 27 min., but during recent years and since the outbreak of war the train has become quite a heavy one. Our own experience on the fastest schedule, included a slight loss of time to Newcastle, with an R class 4-4-0 engine, but easy maintenance of schedule to Edinburgh. Records published in Mr. C. J. Allen's articles have, however, often shown the train run to time on both sections.

[Reply to "LUCKY JIM," B.E.F.]

Superheater Locomotives.

Earlier equipments, and generally with the Schmidt design, enable the damper operating steam cylinder placed on one side of the smokebox near the centre line, to be easily distinguished, but where this is not employed, as usually with the Robinson apparatus, this means of identification is not available. Sometimes the large smokebox, the use of mechanical lubricators, or the release valves now often fitted at the top of the smokebox just behind the chimney, indicate that the engine is fitted with superheating apparatus, but none of these is a certain guide, and as a rule it is necessary to judge from certain technical features, as by the pyrometer in the cab, or to depend upon enquiry or knowledge of the particular engine concerned.

[Reply to E. J. PEARCE.]

Motor Train Control.

Such trains, whether of single car or separate vehicle types, have a driver's control compartment for use when travelling with the engine behind or in the middle. The driver has a brake valve, and mechanical, chain or compressed air connections whereby he can move the regulator in the engine. There is also a cord or chain to operate the whistle. As a rule the driver only operates the regulator, and the fireman who remains on the engine looks after reversing and "linking up"; but sometimes there is an indicator by which the former can instruct the latter, the indicator also showing the position of the reversing gear. Several types of connecting mechanism are in use.

[Reply to E J. PEARCE.]

Signal Trippers.

On the electric and tube railways safety stops are in use, whereby a train passing an adverse signal is "tripped," a trigger alongside the rails being turned upwards to strike a lever which applies the brake, but so far it has not been proved practicable to adapt the same system to ordinary railways, largely owing to the difficulty of providing for high speed movements, and the exposed conditions incidental to installation in the open country and with only very exceptional operation. The general idea is a very elementary one, and hundreds of patents have been taken out for such schemes, but the practical side is far more difficult, as there are many special factors to be taken into account. The problem of safeguarding trains in the event of overrunning signals is, however, very near realisation, and probably a really satisfactory installation would have appeared already, had it not been for the delaying influences of the war upon experimental and new work. As it is, several systems are in practical use, as on the Great Western and North Eastern Railways.

[Reply to E. J. PEARCE.]

Weight of M.G.W.R. Rebuilt Locomotive No. 124.

We are advised by Mr. Morton that as rebuilt Midland Great Western 4-4-0 superheater engine No. 124 *Mercuric* weighs in working order 52 tons 16 cwt. Each bogie axle has 8 tons 15 cwt. upon it, the drivers 18 tons 18 cwt., and the trailing coupled wheels 16 tons 8 cwt. The tender weighs, loaded, 29 tons 7 cwt., of which the leading wheels carry 8 tons 15 cwt., and the other two axles 10 tons 6 cwt. each. Weight of engine and tender in running trim is thus 82 tons 3 cwt.

Railway Gauges.

The Great Western Railway was opened in 1838 with a gauge of 7 ft. (between the inner faces of the rails) and for some years all extensions were similar, including the Bristol and Exeter and other railways in Devon and Cornwall running in connection. More northerly extensions entailed, however, transhipment where connections were made with other railways, and although three-rail mixed-gauge lines helped to overcome the difficultie , the situation became intolerable, and on May 20th-22nd, 1892, the Great Western Railway took the drastic step of converting their exclusively broad gauge lines in Devon and Cornwall to the ordinary gauge of 4 ft. 8½ in., necessitating the temporary stoppage of all traffic on certain sections, in order to bring them into line with the rest of the railway system. The ordinary Continental gauge is virtually the same as ours, except for a few millimetres, so that our engines and vehicles can safely run in France. North America also uses our standard gauge, which is the most widely employed in the world.

[Reply to A. D. DRAPER, Jun.]

[*A number of replies are unavoidably held over until next month.*]

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PERTINENT PARAGRAPHS

A London and North Western Railway "War Seal" Concert.

On December 16th a most successful concert was given in the Directors' Hall, Euston station, to assist the "War Seal" Foundation Scheme, by which homes for London and North Western disabled heroes, of whom there are 1,239, out of 21,200 men with the Colours, will be provided. As described in our December issue, the idea is to erect specially designed dwellings wherein disabled sailors and soldiers may live with their families upon their pensions, with their medical and physical needs provided for on the spot, without any appeals to charity. The "War Seals" are now obtainable in packets of twenty-four (value 1s.) at all London and North Western Railway stations and town offices, or by sending 1s. 1d. in postage stamps to the publicity department, No. 7, Euston Square.

The concert was under the patronage of the Directors, and the following ladies kindly consented to sell programmes under the direction of Lady Alexander: The Viscountess Southwell, The Baroness Percy de Worms, Mrs. M. de Mocatta, Miss Clifford Mills, Mrs. Stephenson Kent, Miss Nance Oldfield, Mrs. Dummett, Miss Mieville, Mr. Lionel Harris, Miss Goodall, Mrs. Upjohn, Miss Simson, Mrs. Croxton, Mrs. Fitch. The programme is a fine collection of jokes and sketches, mostly making fun of the London and North Western Railway. Apparently the perpetrators of these clever and alleged humorous productions have a peculiar animus against Chalk Farm, which figures in quite a number of items.

The programme was as follows: Overture by members of the Coliseum Ladies' Orchestra (Mr. Alfred Dove, musical director); Miss Helen Mar; Signor Van Dock, the Italian Comedy Cartoonist; Miss Ella Shields, in ideal impersonations; Mr. Ernest Shand, comedian; Lois Barker and Percy Tarling as "The Grumblers," in humour and music written by themselves; M. Joseph Hollman, the world-famous 'cellist, in selections from his repertoire; Mr. Wilkie Bard, comedian; Mr. Claude Golden, the Australian card expert; Miss Louise Dale, songs; Sir George Alexander, recitation, "A Lock of Hair" (Yeats); Grock, the great French clown, and his partner; Mr. Fred Emney, "An Old Lady and a Stile"; Tom Clare, a piano and some songs; Mr. Julian Henry, the popular baritone from "Drake" at His Majesty's Theatre; and Miss Hope Charteris, the Australian soprano.

An interesting feature of the entertainment was the sale by auction by Mr. Arthur Croxton of acorns and chestnuts sent by the Mayor of Verdun especially for sale at the performance. This item evoked great enthusiasm, which found vent in the singing of the "Marseillaise" with great heartiness. During the afternoon a telegram was sent to the Mayor of Verdun cordially thanking him for his timely and appropriate gift. About £160 will be realised by the entertainment. The performance concluded with the singing by Miss Hope Charteris of the National Anthem. Hearty thanks were expressed to Mr. Oswald Stoll for kindly placing at the disposal of the Company the managerial, musical and scenic facilities of the Coliseum, and to Mr. Will A. Bennett, Mr. Arthur Croxton, and Mr. Frederick Hare for the souvenir programme and other work.

We may mention that the publicity department of the London and North Western Railway, 7, Euston Square, have now for sale acorns and chestnuts, kindly forwarded by the Deputy-Mayor of Verdun. The proceeds from the sale of these articles, offered at half-a-crown per box, will be devoted to the War Seal Foundation (London and North Western Railway section).

Locomotive No. 1.

Arising out of remarks concerning locomotive coincidences, several readers have written concerning those engines which bear the number "1." We may recall that in the Railway Magazine for June, 1904, the present editor, Mr. J. F. Gairns, contributed an illustrated article entitled "Locomotive Number One," in which particulars were given of many of the locomotives which at that date bore this number.

Mr. G. H. Cannon mentions that he has seen engines numbered "1" on the South Eastern and Chatham, Midland, London and South Western and London and North Western Railways, and asks for the classes of No. 1 on the North Eastern, Great Central and Lancashire and Yorkshire Railways.

On this topic Mr Nunn mentions that he has taken photographs of No. 1 engines of the following railways:

1. Colne Valley and Halstead Railway.
2. London, Tilbury and Southend Railway.
3. Kent and East Sussex Railway.
4. Great Eastern Railway (old 2–4–0).
5. Great Eastern Railway (2–4–2T).
6. London, Brighton and South Coast Railway.
7. Somerset and Dorset Joint Railway
8. Metropolitan Railway (0–4–4T).

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9. Metropolitan Railway (electric).
10. South Eastern and Chatham Railway.
11. Glasgow and South Western Railway.
12. Highland Railway.
13. Brecon and Merthyr Railway.
14. Vale of Rheidol Light Railway.
15. Belfast and County Down Railway (4-4-2T).
16. Belfast and County Down Railway (Raihudta).
17. Listowel and Ballybunion Mono-Railway.
18. Tralee and Dingle Light Railway.
19. Cork and Muskerry Light Railway.
20. Mawddwy Railway (No. 30 Cambrian Railway, scrapped 1913).
21. Great Southern and Western Railway (first engine built, in 1848, old 2-2-2 Bury engine, re-numbered 36).

Besides these he has seen the following: London and North Western Railway, Cambrian Railway, Isle of Wight Central Railway and Mid-Suffolk Light Railway. He also has photos of the only engine on the Easingwold and Tal-y-Llyn Railways, but these companies, together with the Corringham Light, Garstang and Knott End, Weston, Cleveland and Portishead Light Railways and Isle of Wight Railway, do not number their locomotive stock. Mr. Nunn adds: "I should be glad to know if any one can beat this record, because my own experience is that even when visiting the smallest railways, engine No. 1 is generally conspicuous by its absence."

Locomotive Coincidences.

FURTHER letters on this subject include items of interest. Mr. A. T. Blanchet cites an instance where two engines bearing the same number and belonging to the same railway were noticed simultaneously in a station. This was at Richmond, and the engines were both numbered 50, one being on the duplicate list, and the other the then new Drummond engine which had replaced the old Adams engine.

Appropos of paragraphs on this subject, Mr. K. A. C. R. Nunn, a number of whose photographs have been reproduced in these pages, and who, like so many others of our readers, is now serving with His Majesty's Forces, writes: "With regard to consecutive engine numbers, I have two instances of this in my collection of photographs. Both are on the Great Eastern Railway. The first, taken in 1908, is the 10.0 a.m. Liverpool Street to Norwich Express, near Brentwood, and is headed by No. 1033 (4-4-0) and No. 1034 (2-4-0), both rebuilt T19 class. The other instance is of two engines running light, Nos. 1071 and 1072 (C32 class, 2-4-2T). Instances of consecutive numbers passing or following seem common, as I have often experienced with Nos. 2103 and 2104 (4-6-4T) at Upminster, London, Tilbury and Southend section, Midland Railway, and with Nos. 94 and 95 (0-6-4T), Metropolitan Railway, at Wendover. Whilst on the subject of 'double-heading,' I have two photographs of trains worked by *three* engines, these being: (1) a heavy material train, Cardiff-Caerphilly, Rhymney Railway, hauled by Nos. 7 (0-6-0T), 118 (0-6-2T) and 88 (0-6-0T) in rear; (2) 6.15 a.m. Perth-Inverness sleeping car express, Highland Railway, hauled by Nos. 120 *Loch Ness* (4-4-0), 144 *Blair Castle* (4-6-0), and 68 (0-6-4T) in rear. I should say these are unusual cases in Great Britain, and should like to know whether any reader knows of any other occurrences. With regard to foreign working, I have seen nearly every kind of stock pass through Brentwood, on the Great Eastern Railway, in the form of troop and ambulance trains, including some Caledonian and North British stock. In December, 1914, several troop specials were worked through from the Great Western line to Cromer and Sheringham by Great Western engines, mostly of 2-4-0 and 0-6-0 types, whilst it is not generally known that Great Eastern Railway 0-6-0 goods engines have worked through to Holyhead (London and North Western Railway). Such occurrences are frequent in war time, but in my collection I have a rather unusual photograph of a through train from York to Bournemouth, hauled by Great Central Railway (4-4-0) No. 1037 and Great Western Railway (4-2-2) No. 3073 *Princess Royal*. This occurred on Easter Monday, 1911, the Great Central pilot being attached at Leicester owing to holiday traffic."

The Changes of Twenty Years.

REMARKS contained in a recent "Pertinent Paragraph" regarding the impressions of a correspondent who re-visited the Portsmouth district after 21 years' interval, have prompted an old reader, Mr. P. Weil, to write in a similar strain: "In my case it is also of Brighton and South Western engines and trains of over 20 years ago, for I had the good fortune to live near Clapham Junction. I was a schoolboy then, and never a Saturday morning came but I rushed off to my beloved footbridge which formed the entrance to the station from the top of East Hill, and which, with its latticed web and broad top flange, afforded a grand foot-hold and elbow-rest for us enthusiasts. I knew all the trains; the 10.0 o'clock Newhaven Boat Train, and the Brighton Pullman following 5 min. later, were my favourites. How beautiful the Stroudley 'Gladstones' looked in their resplendent uniforms and copper-capped chimneys! When I see a Stroudley engine now with the hideously incongruous cast-iron chimney, I am moved almost to tears by the sacrilege. A Stroudley engine without a copper-capped chimney! The glorious yellow paint, and even, if needs be, the names, one gets over their loss in time. But the new chimneys—never. The latter are quite all right in their place, but on the Stroudley—the Venus among engines—they are interlopers."

"Regarding the names, I must say it would give me great pleasure to see again the well-beloved names familiar to me on those immortal Saturday mornings. Well I remember the eagerness with which I used to await the various expresses, wondering if perchance there would be a new 'type' at the head. And oh,

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the excitement when *Duncannon*, the first Brighton bogie express, made its appearance one morning. I had been half expecting it for some time, because of the bogie tanks (*the* first bogie engines on the Brighton) which had appeared already. The typical Billinton raised frames greatly took my fancy."

"I believe the greatest excitement of all was caused by the advent, one morning, of London and South Western Railway No. 720, in lead colour. It was evidently her first trip. I thought she must be a Webb 3-cylinder compound; she looked so like it with her uncoupled wheels, small outside cylinders, and Joy's gear. But her exhaust was bewildering; afterwards, when I knew her better, I understood. Last year I saw No. 720 again, at Southampton. She was magnificent with her big new boiler, and I was delighted to note, was on first-class duty, despite her 18 years. Another milestone on the road of locomotive development was Great Northern Railway 990. How the dignified connecting-rod of that engine impressed me!"

Another long-standing reader, now resident at Newark-on-Trent, recalls the days when he used Clapham Junction station regularly, when there were none of the modern big 4–6–0 and 4–4–0 engines on the London and South Western Railway, while the introduction of a Brighton engine with more than six wheels was a matter for special remark. When he went to Newark the famous Great Northern 8-footers were still on first class work; yet the appearance early last year of one—No. 1007 (?)—to work the 8.1 a.m. *ex*-Newark to Grantham (one carriage, to join the Nottingham–London express) was a matter of special interest to him, as it would be to most of us who can remember these engines in the heyday of their existence. Now, of course, it is all "Atlantics," and even one of the Ivatt bogie singles is a rarity, while the 4–4–0 engines take quite a small share in first class work on the main lines.

War-Time Railway Traffic Working.

Mr. J. Andrew, of Dukinfield, mentions that on the Great Central Railway, in the Manchester district, he observed a Great Eastern 2–4–0 mixed traffic engine, No. 430, running light. This is, however, not altogether exceptional, seeing that for several years past Great Eastern engines have worked *viâ* Sheffield to the Manchester district, though generally on goods trains. And as No. 430 is of mixed traffic class it is probable that is the explanation in this case. Mr. J. S. Gage, of Warminster, mentions a train on the Midland and South Western Junction Railway composed of Midland, Great Western, London and South Western and Midland and South Western Junction coaches, hauled by a Great Western Railway tank engine. A Brighton reader sends quite a long list of London and South Western engines which have appeared on trains at Brighton Central station, which includes nearly all the 4–4–0 classes up to the 420 series, as well as goods and 0–4–2 types. Ten South Eastern and Chatham engines are also mentioned, together with Great Western Railway 4–4–0 engine *Singapore*. Mr. W. A. C. McConnell mentions a goods train noticed in Scotland including a Caledonian 4–6–0 engine, and vehicles belonging to the Caledonian, Great Central, Great Northern, London and South Western, Furness, Highland, Midland, North British, Glasgow and South Western, North Stafford, Great North of Scotland, London and North Western and several privately-owned wagons, besides a West Coast Joint Stock corridor brake van and several London and North Western and London and South Western milk vans. He also refers to the use of North Eastern goods engines on the Glasgow and South Western Railway, and Great Central 0–6–0's on the Caledonian. Mr. W. L. Kenning refers to Great Western engines seen at Purley and Red Hill, South Eastern and Chatham Railway, engines of the latter system at Didcot and Oxford, Great Eastern engines at Oxford, and London and North Western, Great Central and London and South Western locomotives at various places on the Great Western Railway. He also refers to the working of Great Western engines to Holyhead; also the appearance of Great Western vehicles at Caterham, South Eastern and Chatham Railway. Mr. H. V. Crowder mentions that he recently noted at Birkenhead one of the latest Great Western 2–6–0 engines, No. 5304, and alongside it 2–4–0 tank engine No. 1, respectively nearly the highest number yet used and the lowest. At Oxford he has noticed saddle tank engines Nos. 1996 and 1669 together, and of the same class he saw some time ago Nos. 1686, 1687 and 1688 standing coupled together. At the same place Great Central Railway 4–6–0 engine No. 1096 was standing by the turntable when Great Western Railway 0–6–0 engine No. 1096 passed on a goods train.

To our Readers.

Christmas and New Year greetings have been forwarded by numerous Railway Magazine readers, and in expressing their high appreciation of our efforts to provide monthly issues of real interest and value, notwithstanding the many difficulties occasioned by the war, have also conveyed the compliments of the season in no uncertain terms to the Editor and Management. Our thanks may be expressed for these kindly and encouraging remarks. Many are from readers in Canada and colonies or countries overseas, and we would specially acknowledge a calendar received from Mr. R. C. Carter, of Winnipeg, a number of whose excellent photographs have been reproduced in these pages, and greetings from Mr. E. J. Clarke, for a period Secretary of the Railway Club, Westminster, and now domiciled in far-away Alaska, and engaged in railway working there.

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WHAT THE RAILWAYS ARE DOING

CERTIFICATES and prizes gained by students at the Horwich Railway Mechanics' Institute Technical School were recently distributed by Mr. George Hughes, Chief Mechanical Engineer, Lancashire and Yorkshire Railway, in the large hall of the Institute. Supporting Mr. Hughes were Messrs. Gibson, Crompton, Billington, and several other members of the Institute Committee, and there were present also Mr. J. McLean (principal of the Technical School), several members of the teaching staff, and the winners of certificates and prizes. Mr. Hughes, in his address as Chairman, gave a review of the Institute's work for the previous twelve months.

* * *

THE eighth of the series of efficiency meetings of the operating department of the London Underground Railway and L.G.O.C. Group was held at the L.G.O.C. Training School, Milman's Street, Chelsea. Mr. H. E. Blain, Operating Manager, presided over an audience numbering nearly 200 officials. Papers on "Staff Welfare Work" were read by Mr. J. Thornton (Chief Inspector, District Railway) and Mr. M. Lansdown (Assistant General Superintendent, L.G.O.C.). The attendance included, on the railway side: Messrs. Murray Griffith (Director), J. C. Mitchell (Treasurer), A. R. Cooper (Engineer), J. L. B. Lindsay (Assistant Secretary), W. E. Blake (Superintendent of the Line), S. J. Webb (Passenger Agent); and, on the L.G.O.C. side: Messrs. G. J. Shave (Engineer), J. P. Thomas (General Superintendent), Capt. Rozier (Superintendent of Employment), H. Dawson and R. Johnston (Claims Department), with Mr. W. E. Hammond (Traffic Manager, Metropolitan Electric Tramways), and the chief members of the controlled staff of the various affiliated companies.

* * *

IN presenting Mr. J. Mallinson, late chief of the time-table department, London and North Western Railway, with a cheque subscribed by a large number of his friends and colleagues in the service, Mr. L. W. Horne, Superintendent of the Line, expressed the regret he felt that the time had come when Mr. Mallinson considered that he must sever his official connection with the Company. Mr. W. M. Turnbull and Mr. Guest added warm words of appreciation and good fellowship. Mr. Horne said Mr. C. J. Bowen Cooke, Chief Mechanical Engineer, had asked him to say how sorry he was he could not be present at the meeting as he intended. A large and representative gathering of the officers of the Company were present on the occasion. Mr. Mallinson joined the service in September, 1873, as a junior clerk in the office of the Birmingham District Superintendent, and had charge of the goods train reports; later the passenger train reports, and later again the correspondence of the trains office. In 1881 he was placed in charge of all the ordinary passenger and excursion train arrangements, and fourteen years later Mr. Robert Turnbull (now Sir Robert) appointed him chief of the London and North Western time-table department at Euston, in which position he remained up to his retirement.

* * *

WE regret to announce the death from pneumonia of Mr. R. H. Burnett, M.Inst.C.E., London representative of Messrs. Beyer, Peacock & Co., Ltd., Gorton, Manchester. Mr. Burnett had been the firm's London representative for the last five years, but had been connected with them at home and abroad more or less all his life. Mr. Burnett had been engaged in the design and construction by Messrs. Beyer, Peacock & Co. of the celebrated engines that the Metropolitan Railway had caused to be built when they found that they had to provide their own locomotive power. The deceased gentleman was Locomotive Superintendent of that line for Sir John Fowler from 1864–72, and claimed to have been the first user of a continuous brake that was operated from the footplate. Mr. Burnett was a Vice-President of the Institution of Locomotive Engineers, and was nominated on the Saturday before his death for re-election at the forthcoming annual meeting.

* * *

CONGRATULATIONS to the Rt. Hon. Charles Beilby Stuart-Wortley, upon whom His Majesty the King has conferred a peerage. This gentleman is best known to RAILWAY MAGAZINE readers because of his railway associations. He is Chairman of the City and South London Railway, and a Director of the Underground Electric Railways, and the Great Central Railway. Sixty-five years of age, he has sat in the House of Commons for an uninterrupted period of thirty-six years. He was Unionist member for the undivided borough of Sheffield from 1880 to 1885, and has represented the Hallam Division of Sheffield since 1885. He was Under-Secretary for Home Affairs in Lord Salisbury's first two Governments, and has for some time been temporary Chairman of Committees.

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AWARDS in the annual Midland Railway competition for the most neatly kept platform gardens at passenger stations, amounting in the aggregate to £350, have been made. The gardens are inspected from time to time by experienced persons authorised by the General Superintendent, and the prizes are allotted for each year up to September 30th. This year the first prize has again been awarded to Spondon, Alcester ranking close up for second place, while the third prize has been won by Malvern Wells. Other leading prizes have been secured by Morecambe, Borrowash, Charfield, Five Ways, Matlock Bath, Defford, Penns, Credenhill and Kegworth.

* * *

IT is contemplated that electric trains from the "Bakerloo" section of the London Electric Railway will shortly commence running through to Watford, over the London and North Western Railway, and trial runs have already been made with "Bakerloo" trains on this route. New stock is, however, being introduced, adapted for the higher speeds necessitated north of Willesden Junction, and with entrance platforms constituting a compromise to suit the low "tube" platforms and the higher ones on the London and North Western Railway.

* * *

THE balance sheet for the year ending September 30th, 1916, issued by Messrs. D. Napier & Son, Ltd., shows a profit, after allowing for depreciation of premises, plant and tools, of £76,856, which, with the balance brought forward from the last account, makes a total of £86,695. A dividend of 6 per cent. is declared on the ordinary shares, and a further £20,000 placed to general reserve. It is pointed out that the firm has during the past year continued to supply practically its entire output to the British and Allied Governments, and has remained a controlled establishment under the Munitions of War Act, 1915. The demand for increased output has necessitated a further outlay on plant, machinery and buildings, and will continue to do so during the current year.

* * *

IN addition to its activities in the production of artistic railway booklets and posters, the Photochrom Company, Ltd., Old Bailey, London, E.C., possesses a great reputation as publishers of calendars printed in black and white and in colours. Those for 1917 not only maintain but considerably enhance the fame of the firm for excellence in printing and general effect. All tastes are catered for, the subjects being particularly wide in range. Mr. Lambert, the managing director of the Photochrom Co., Ltd., is to be congratulated on his keen capacity for producing just what the public will appreciate.

* * *

AT the last general meeting of the Institution of Locomotive Engineers, held at Caxton Hall, Westminster, Mr. W. A. Lelean, Vice-President, who occupied the chair in the absence of the President, announced that Mr. A D. Jones, Outdoor Running Superintendent, South Eastern and Chatham Railway, had accepted the Presidency for 1917. Mr. Smith Mannering, Chief Boiler Inspector, London, Brighton and South Coast Railway, then read a paper on "Locomotive Fireboxes."

* * *

ON Wednesday, December 6th, a new club for women employed on the administrative staff of the Underground Railway Group at their head office, Electric Railway House, and at the Earl's Court and Oxford Circus ticket sorting offices, was formally opened by Sir Albert Stanley, in the presence of most of the officers of the companies and a large number of the female staff. The premises are entered from Earl's Court station, and the building consists of five storeys. The basement contains the kitchens and offices, the cooking apparatus, which is entirely electrical, consisting of four baking ovens, large boiler and steamer, boiling plates, grill, etc., suitable for the cooking of 200 meals. There is also in the basement an adjoining room, capable of seating 40 persons, and two additional dining-rooms on the ground floor accommodating another 64, a suitable servery being attached, with lift direct to the kitchen; electrically heated carving table, plate warmer, and urns are provided in this servery. The first floor is taken up by rest and club rooms, with a small library. Luncheons are provided for the female staff at a low inclusive figure, and the premises are available for their use for social and other purposes.

* * *

MR. WALTER H. HYDE, formerly General Manager, Great Eastern Railway, has been elected by the Board of the Railway Benevolent Institution to represent them on the Committee of Management of the Railway Servants' Orphanage at Derby.

* * *

A NEAT calendar is supplied by the London General Omnibus Co., Ltd., though it is far less ambitious, in consonance with the spirit of the times, than we have become used to associate with "Underground" publicity. There are six cards, with two months on each, and the illustrations and text references are all of war interest. The former show motor omnibuses serving at "the Front," including one "that will not return to the London streets"—it has come seriously to grief—and another with German soldiers in possession.

* * *

ON the Metropolitan Railway women are being trained as guards and "gatemen" on electric trains, this being, it is understood, the first instance where they have taken over the actual "train responsibility" or have taken a part in the direct working of trains. At present they are working mainly on the Extension line, on local electric trains to and from Baker Street, but their appearance on all services may be expected shortly. Women are also being employed on certain "tube" lines as intermediate "gatemen" at busy periods.

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MR. JAMES H. WOOD, of the Don Press, Penistone, sends a copy of the "Penistone Almanack." Described as "The Local Whittaker," and claiming a circulation of 6,000 copies, this is an interesting brochure of 256 pages, with 50 illustrations. A large proportion of the contents are such as may be expected in a publication of its class; but the Illustrated Literary Supplement is of interest to RAILWAY MAGAZINE readers, because of the articles on the Penistone Viaduct disaster, Woodhead Tunnel, the Keadby Deviation Bridge and Great Snowstorms, the last with particular reference to the storms which created so severe difficulties on our railways in February and March, 1916. These articles are illustrated and that on the Keadby Deviation is partly quoted from our pages. A local "Roll of Honour," with portraits, is an interesting feature of the booklet.

* * *

IN partial compensation for the withdrawal of many restaurant car services, the Great Eastern Railway Hotels Department has introduced food boxes. These are supplied at moderate cost on the vestibuled trains or at principal stations. Arrangements are also being made for supplying tea and coffee on certain trains. These food boxes are of cardboard, and divided into four compartments, the viands being packed in grease-proof paper bags. Three types of food boxes were at first introduced, as follows:

BREAKFAST, 1s. 3d.—Two toast and bacon sandwiches, one sausage-roll, one buttered French roll, one apple.

LUNCHEON, 1s. 6d.—Two ham or tongue sandwiches, one mutton pie, one fruit tartlet; cheese, roll, and biscuits; one apple.

DINNER, 1s. 9d.—One fish cutlet, one veal and ham pie, one fruit tartlet, cheese, butter, biscuits, one apple.

Later, in deference to a decision of the Food Controller that they contravened the regulations as to the number of courses permissible, they were replaced by "Light Refreshment" boxes, slightly differently made up, and priced at One Shilling and One Shilling and Sixpence respectively.

* * *

AT the 38th Staff Welfare Concert of the London General Omnibus Company, held at the Training School, Milman Street, Chelsea, the musical items were given by members of the London and North Western (London) Operatic and Dramatic Society. During the evening there was an Inspection and Parade of 72 woman conductors who had completed their training, followed by an address by Mr. Cecil F. Grasemann, on "Staff Social Welfare Work." Mr. Grasemann is one of the chief assistants to the General Manager, London and North Western Railway, and is well known in connection with all North Western staff matters.

* * *

WE are indebted to Mr. Lendrem-Ainslie for particulars of the landslip on the Waverley route of the North British Railway, which occurred on December 14th, almost in the centre of the town of Galashiels. The landslip brought down with it a high retaining wall, close to the mouth of Ladhope tunnel, a short distance north of the station, and completely blocked both lines. At this place the engineering works have required close attention and strengthening operations were in progress, some of the men employed having a narrow escape from being overwhelmed. A train from Peebles to Galashiels had passed only a few minutes before. For the time being passengers from the northern side had to alight at a siding beyond the tunnel, while through trains had to be operated *viâ* the Caledonian route to Carlisle. Later a local motorbus service was instituted, and train services suitably arranged, until the section could be cleared for single-line working.

* * *

WE regret to record the death of Mr. James Stirling. His work as Locomotive Superintendent of the Glasgow and South Western Railway has been fully reviewed in Mr. Ahron's articles upon the locomotives of that railway. From Kilmarnock Mr. Stirling came to Ashford, and he was Locomotive Superintendent of the South Eastern Railway until the amalgamation with the London, Chatham and Dover Railway, in 1899, when he retired. As one of the old school of locomotive engineers, Mr. James Stirling had a high reputation, and his work and influence upon subsequent development will long be remembered.

* * *

THE Railway Club report and statement of accounts presented at the Annual General Meeting on Tuesday, January 9th, were satisfactory in that, with due account of the number of members now serving with His Majesty's Forces—nearly 25 per cent. of the total—and the difficulties of the times, the Club has maintained its position and standing. The President (Mr. W. Parker) congratulated the Hon. Secretary and Treasurer upon the record for the year, and expressed the hope that with the cessation of hostilities progress due to the association would be realised. Following the formal business, Mr. B. M. Bazley read an exhaustive and illuminating paper upon the Cheshire Lines Committee, its history, lines and traffic. At the meeting on February 13th, Mr. H. L. Hopwood will deal with the Great Northern Railway west of Grantham.

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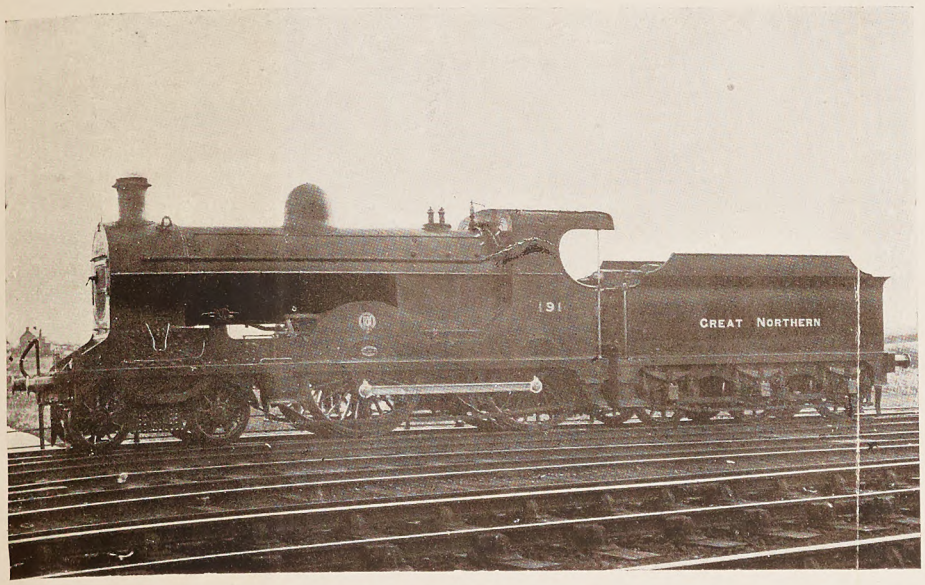
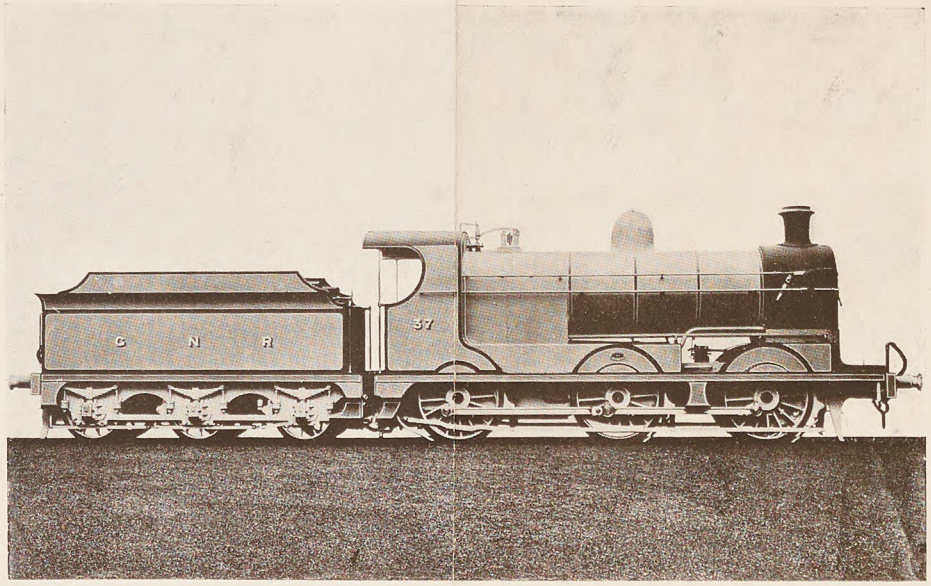
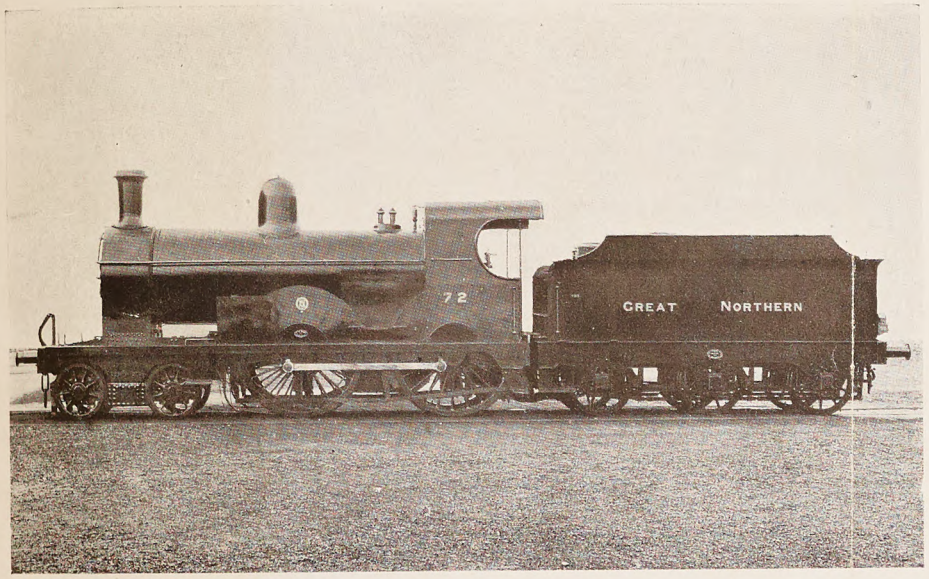


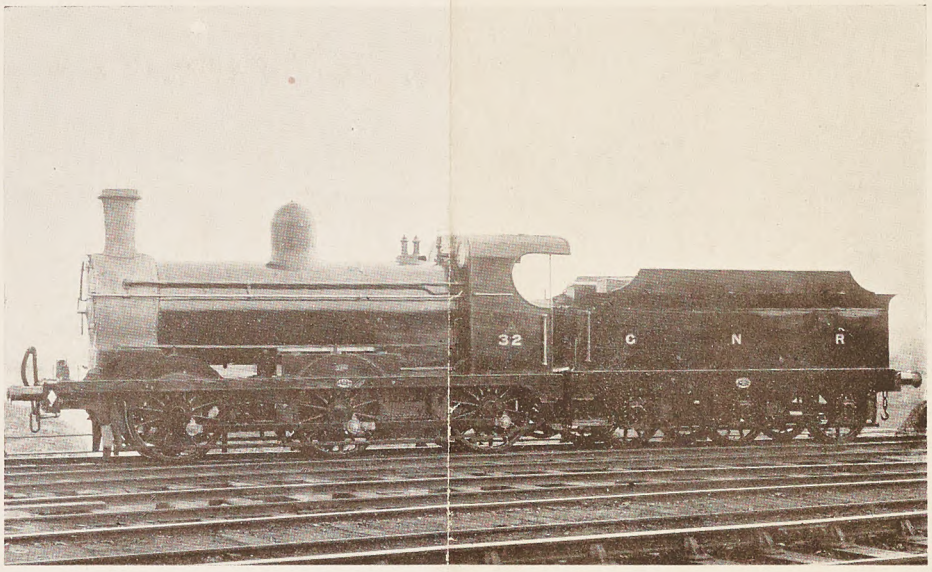
New Superheater Main Line 4-4-0 locomotive, No. 191.



Standard Superheater Goods locomotive, No. 37.



Rebuilt 4-4-0 locomotive, No. 72.



Rebuilt Goods locomotive, No. 32.

STANDARD MAIN LINE & REBUILT 4-4-0 & 0-6-0 TENDER LOCOMOTIVES:
GREAT NORTHERN RAILWAY (Ireland).
Mr. G. T. Glover, M.I.C.E., Locomotive Engineer.

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Photo] [*J. Macartney Robbins.*

NEW 4–4–0 SUPERHEATER ENGINE NO. 191 ON 10.45 A.M. BELFAST TRAIN LEAVING DUBLIN.

Dundalk Works : Great Northern Railway (Ireland).

By J. F. GAIRNS.

COMPARED with the greater English lines the Great Northern Railway of Ireland would occupy quite a secondary place, and one cannot expect that its locomotives, carriage and wagon works should be on a scale approaching that, for example, of the Great Northern Railway of England. But in Ireland the Great Northern comes second only to the Great Southern and Western Railway in regard to mileage, rolling stock statistics and volume of traffic, and by virtue of its providing the principal link between the northern industrial districts, and the commercial capital, Belfast, and the governing city, Dublin, besides connecting Londonderry with both Dublin and Belfast, its position and standing are high. It follows, therefore, that the mechanical engineering department is by no means a small one, and that to maintain the 204 locomotives, 688 passenger train vehicles, 5,811 goods wagons, and 295 service wagons, Mr. G. T. Glover, Locomotive Engineer, requires premises of considerable size and capacity.

The "Works" are situated at Dundalk, nearly half-way between Dublin and Belfast, and therefore convenient for all portions of the line, especially as Dundalk is the junction station for a considerable proportion of the western lines, though the principal Londonderry services are usually operated *viâ* Portadown. They were first erected in 1880, prior to which date there had been several small shops in various places, mostly belonging to individual lines brought into one system by amalgamation. All work is now concentrated at Dundalk, except that there is a good sized fitting shop at Belfast and small shops attached to the engine sheds in Dublin and Londonderry.

Situated about a quarter of a mile south of Dundalk Junction station, and on the western side of the town, the works cover an area of 14 acres, and altogether about 700 men are employed, exclusive of the engine shed and running staff. Like many other railways, the war has reduced the number of men employed. Most of the shops lie west of the main lines, and the northern limit is marked by the single track leading from the Enniskillen branch to Barrack Street, which leaves the station at the south end and curves away in a south-westerly

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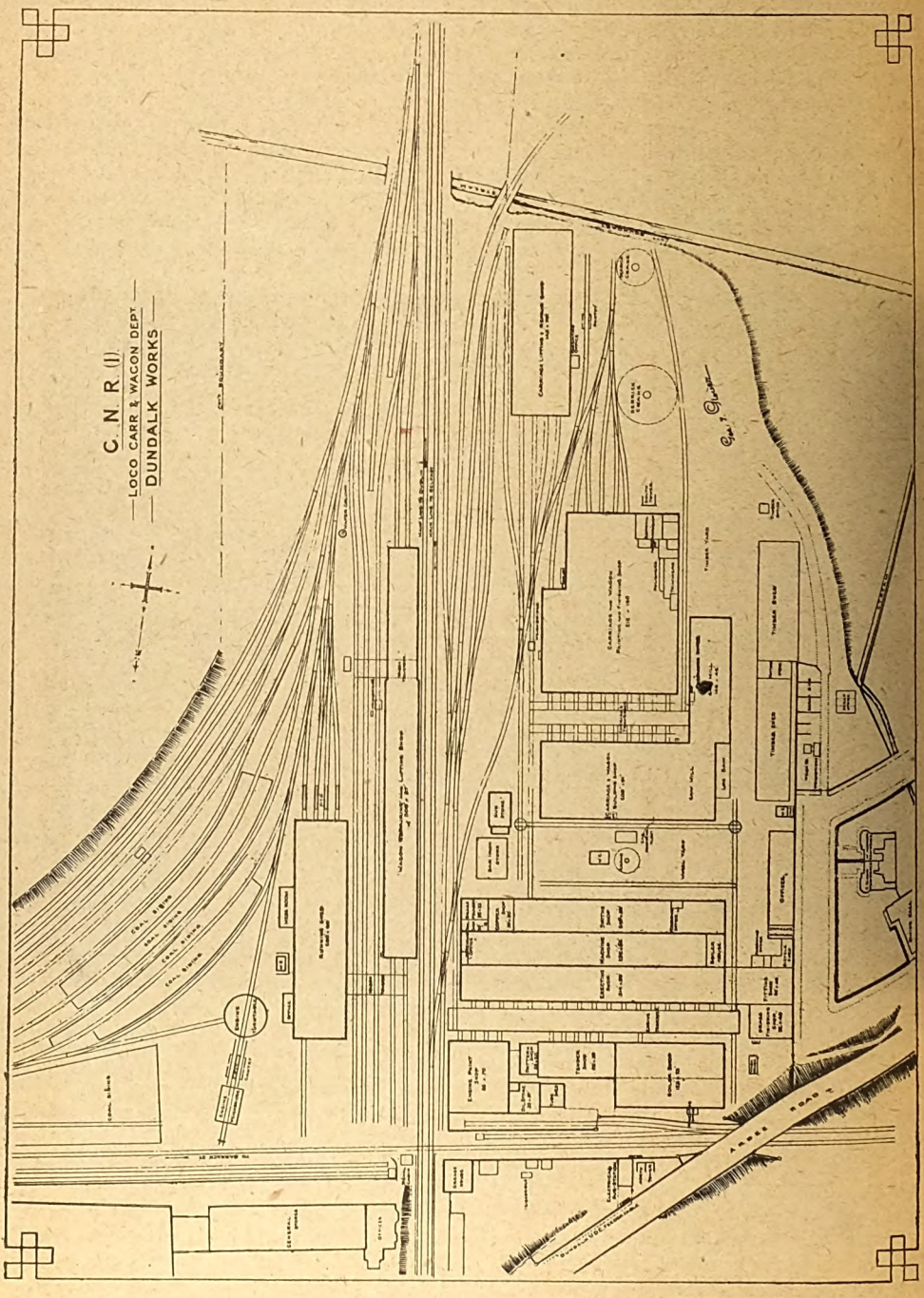

PLAN OF DUNDALK WORKS: GREAT NORTHERN RAILWAY (IRELAND).

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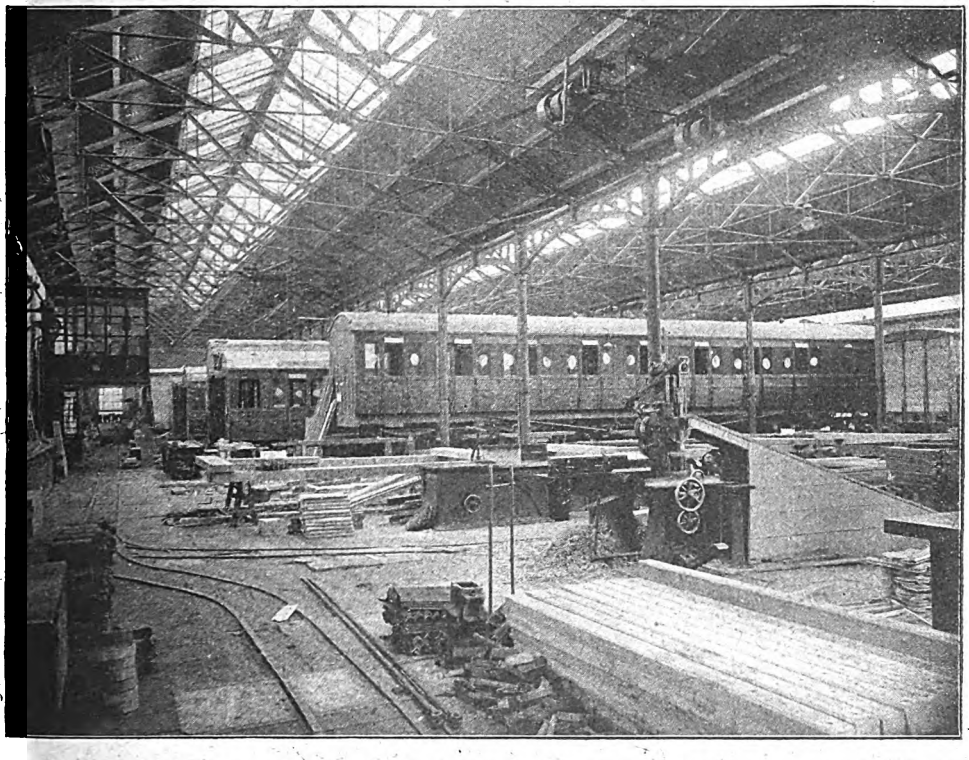
direction to the Barrack Street goods station, and to Quay Street station (London and North Western Railway). This route is used by London and North Western trains between Dundalk and Greenore, but is the property of the Great Northern Railway as far as the Barrack Street goods station, and some of their goods trains, and engines from the Dundalk engine shed, also use it. This line crosses the main line at a right angle.

Entrance to the works is had from Ardee Road, near its crossing over the railway, an inclined path leading down to the main gates alongside the offices constituting the usual approach, though there is direct access on the level from the portion of the town to the west of the line.

Adjoining are forty workmen's houses belonging to the company, and in addition there is a dining hall and recreation rooms for the staff, where also classes are held for training the junior members of the staff.

The main office building is a neat two-storied red brick structure, with a main entrance way at one end. Originally there was only the central portion, but extensions were authorised in 1912 so that the Locomotive Engineer could concentrate the whole of his staff in one building.

On the ground floor is accommodation for the Locomotive Accountant, Mr. G. H. Raeburn, and his staff, the time office adjacent to the entrance being also under his control; for the Running Superintendent, Mr. A. W. Denniss; and for the Works Manager, Mr. R. Wild. Mr. G. T. Glover's private office is in the centre of the upper floor, and is distinguished by a bow window, and adjacent are the offices of the Chief Clerk, Mr. J. W. Jennings, and his staff. In the extension at one end is a well lighted drawing office, under the direction of Mr. L. J. Watson, Chief Draughtsman, while over the works entrance Mr. A. W. Whieldon, Electrical Engineer, has accommodation. Adjacent is a laboratory and testing room. The total office staff employed is about 42. The offices are electrically lighted and connected up with inter-office telephones (Parson–Sloper patent), which also run to the general stores and shops.



INTERIOR OF NEW CARRIAGE SHOP, LOOKING EAST.

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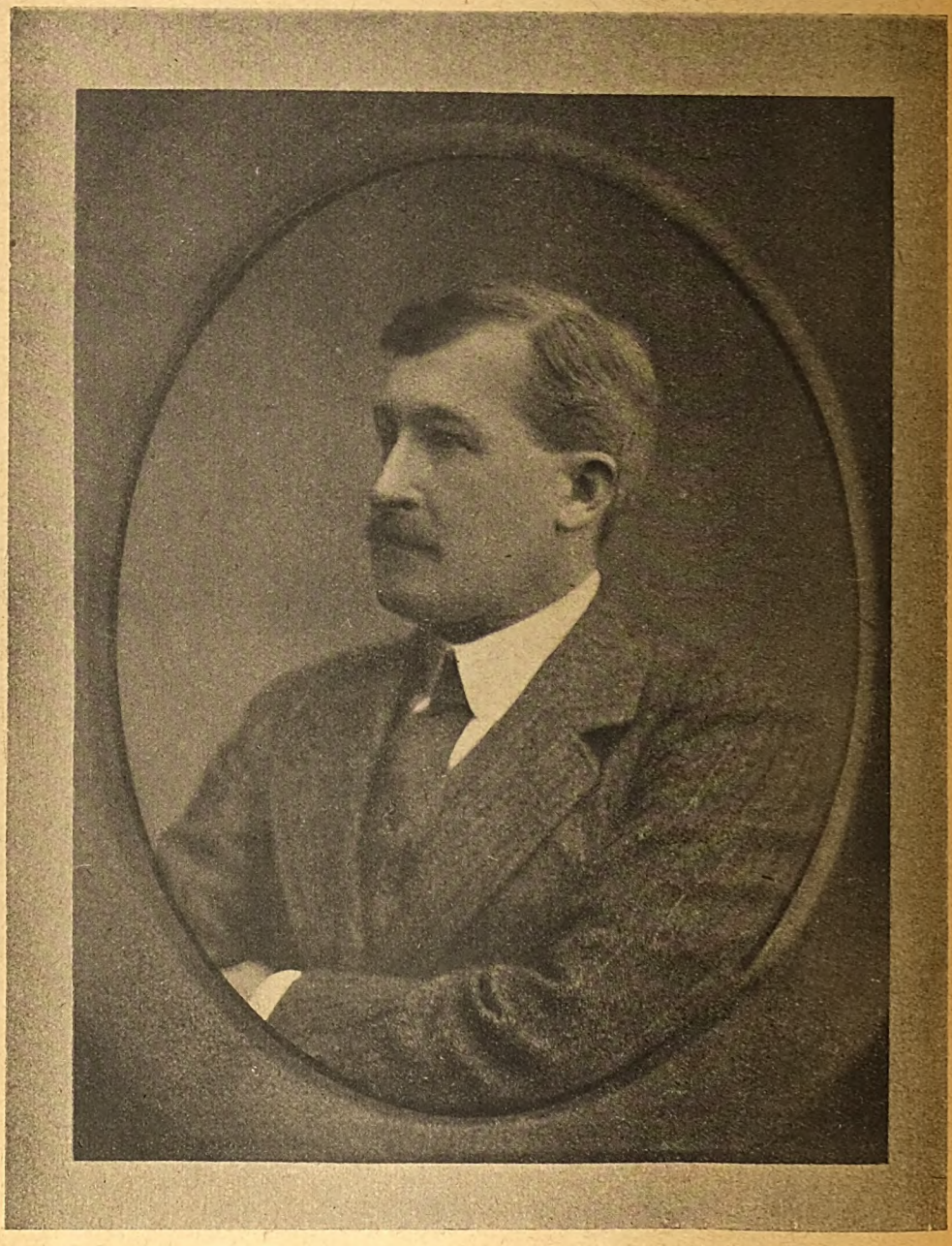

MR. G. T. GLOVER, M.I.C.E.
Locomotive Engineer,
Great Northern Railway (Ireland).

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Although Mr. Glover has been at Dundalk less than five years, a number of improvements have been made. Of the new buildings the most important is the carriage painting and finishing shop, most of which is new in consequence of a fire which occurred in April, 1913. The present structure is virtually new throughout, as the damage done was so considerable that not much of the old structure could be utilised. Adjacent to this is the timber machine shop, of which the extensive saw mill is new, while the equipment of machines is essentially up-to-date and of special interest. Another extension is that of the erecting shop, at the west end. Further extensions are in contemplation, one filling in the space at present occupied by the engine traverser between the erecting shop and the boiler, tender and engine paint shops; and the other to complete the block formed by the carriage and wagon building shop, carriage painting and finishing shop and the new saw mill. These extensions, however, will not be considered until the conclusion of the war.

There is, however, another important feature in the modernisation of the works, and that is the complete electrification thereof so far as lighting and power is concerned. The work was finished early last year, and now steam is only employed for driving the hammers and air compressors, and even the two latter are to be adapted for electrical operation in due course.

Current is purchased from the Dundalk Urban District Council, and is received at the sub-station alongside Ardee Road. A leading feature is that from the sub-station the main conductors, consisting of bare copper wire, are stretched right across the buildings between straining towers erected, one alongside the sub-station, the other beyond the carriage painting and finishing shop, intermediate support being given by A-type frames erected on the roofs of the buildings. Connections are made as the various shops are passed over, further distribution to other parts of the works being by conductors at right angles carried on suitable supports. The current is received at 460 volts for power purposes, and 230 volts on the three-wire system for lighting, small tools and heaters. Motors of the Electric Construction Company's 25 and 10 H.P. designs have been installed, some driving singly, others driving on to the old shop shafting systems and operating relatively small groups of machines. The main drives on the engine side of the works are by Renolds chains, whilst on the carriage side Hendry laminated leather belts have been adopted. In the sub-station building the Corporation meters, junction boxes, Railway Company's meters and recorders, together with the main switchboard by the Hunt Electrical Manufacturing Company, Belfast, have been erected. Lighting in the shops is exclusively by half-watt and metal filament lamps.

It is now necessary to deal with the various shops, and the group nearest Ardee Road may be first considered. The boiler shop is 123 ft. long by 75 ft. broad, divided into two bays. The machine bay is served by an 8-ton overhead crane and is equipped with a plate edge planer, a big radial drill of a somewhat old pattern, a new Asquith radial drill used for drilling the flanges of tube and end sheets and the like, a large punch and shears, a cold saw, and large and small plate rolling machines. In one corner, at the east end, is a new set of stay-making machines by Craven Brothers, and at the other end there is a gas and air furnace for brazing tube ends. Outside is a tube stretching machine, though tubes are now generally pieced for re-use, while adjacent is a rumbler for cleaning tubes.

In the boiler bay at one end are three smiths' fires and anvils for angle iron working. Adjacent to the side wall is a hydraulic rivetter with a pit enabling the largest boiler barrels now in use to be dealt with. There is also a portable hydraulic rivetter. In the corner is the hydraulic plant, including pump and accumulator. Remaining space is occupied by boilers in various stages of construction or repair. For detail work pneumatic tools are extensively employed, and complete pneumatic connections are provided for portable tools. In addition to usual patterns, a special type of machine is employed for knocking-up the heads of copper stays, producing a particularly neat and satisfactory result. I was informed that for some time past stay leakage has been eliminated owing to the better fit of stays and the more efficient heads. This bay is also provided with an 8-ton crane.

Adjoining the boiler shop is the tender shop, 95 ft. long and 39 ft. wide. This has five transverse pits served from the engine traverser, with wall benches for fitting work. The shop is equipped with a 24-ton overhead electric crane. At the end is the pattern-makers' shop. Here are also kept a

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CHIEF ASSISTANTS, LOCOMOTIVE DEPARTMENT, GREAT NORTHERN RAILWAY (IRELAND).

Standing (Left to Right): Mr. L. J. Watson, Chief Draughtsman; Mr. J. W. Jennings, Chief Clerk; Mr. G. H. Raeburn, Locomotive Accountant.

Seated (Left to Right): Mr. R. Wild, Works Manager; Mr. A. W. Denniss, Running Superintendent; Mr. A. W. Whieldon, Electrical Engineer.

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number of patterns, but the main pattern store is elsewhere, and as heavy castings cannot be undertaken the larger patterns are usually at the founders' premises.

The space between the pattern shop and the engine paint shop is partially railed in to form a lock-up enclosure for copper piping and other valuable materials. In this enclosure is one of the cylindrical air reservoirs for pneumatic appliances, of which several are located about the works. Adjacent are racks where drop forgings made in quantities are stored for use as required. The engine paint shop, 82 ft. by 70 ft., has four roads served from the traverser. Each track will accommodate two engines and one tender, or one engine and two tenders. The shop has usual equipment for the duties carried on. Among the engines in the paint shop the writer noted one of the rebuilt 4–4–0 engines, illustrated on the plate preceding this article, and one of the rebuilt 0–6–0 goods engines. In this shop he also observed a handy oil-driven machine for turning the wheels when valve setting, dispensing with labourers and pinch bars.

It may here be explained that goods engines are now classified by the letters A, B, C and D placed above the number, to designate their load rating, while in view of the axle weight restrictions on parts of the line, engines which can go over all sections are distinguished by a white diamond placed on the end of the buffer beam.

The line outside, alongside the main lines, is usually occupied by the 15-ton steam breakdown crane stationed at Dundalk. The group of shops under notice is completed by the oil store and the tube shed. Adjacent are two sidings off the Barrack Street single line.

Dealing now with the erecting shop, this is 314 ft. long and 39 ft. wide, with 17 roads served from the traverser, which is electrically operated by wire ropes. Each pit has its own doorway to the traverser, and two of the engine lines are continued through into the machine shop alongside, but one only is used for general access. It is known as the "centre pit," as it used to be, though it is now only about one third of the length along.

A 40-ton Craven electric overhead crane is fitted to traverse the whole of the erecting shop. Along one side wall is a length of shafting from which portable cylinder-boring, valve facing and other tools can be driven, no matter which pit the engine they are employed upon may occupy. There are, of course, the usual benches and equipment for fitting work carried on in the erecting shop itself. At one end is the air compressing plant, at present steam operated, with boiler house outside, though this also will be electrically driven very shortly. A peculiarity of the erecting shop, as also of the smithy on the further side of the machine shop, is that the electric motors for driving the various sections of the main shafting are carried respectively on brackets attached to their walls, in order to obtain the requisite spacing for the chain drives to the shafting in the machine shop itself.

At the end of the erecting shop are two extension buildings, erected in 1914. The larger portion, 80 ft. by 40 ft., is served by a light 3-ton overhead crane, and is utilised mainly for dealing with motion work—valve gear, fitted driving wheels and axles, eccentrics, rods, etc. Suitable fitters' benches are provided, while there is in addition a testing table for valve motion. The second extension, 52 ft. by 40 ft., is the brass finishing shop. Against one wall are lockers numbered to correspond with each pit in the erecting shop, and all brass fittings removed from engines under repair are placed in these until again required. There are several interesting machines in this shop which, as a new addition, was the first to be fitted with electric drive. Among the tools may be noted a Smith and Coventry brass finishing and turning turret lathe with template and adjustable stop control, besides various lathes and buffing and emery machines. Outside the building is a "bosh" for cleaning motion.

The machine shop is 292 ft. long and 39 ft. wide. Down the centre is a mono-rail walking crane. The shop is served from outside by the "centre-pit" road through the erecting shop or through the smithy to the wheel yard. The western end is the wheel-turning shop. Equipment includes two large wheel lathes, one with 7 ft. face plate, and four smaller ones. Against the wall is a Greenwood and Batley screwing machine.

The middle portion is the general section. Here are a number of drills, ordinary and radial, and of various sizes, planers, slotters, lathes, a Beyer, Peacock universal grinder, a large centre-drive Craven axle lathe (a new machine, fitted also with a roller fitting for surfacing bearings), a Pollock and McNab turret lathe and several other tools. The end section, nearest the main line of railway, is the cylinder shop. Here are planers and slotters, cylinder boring machines, a vertical

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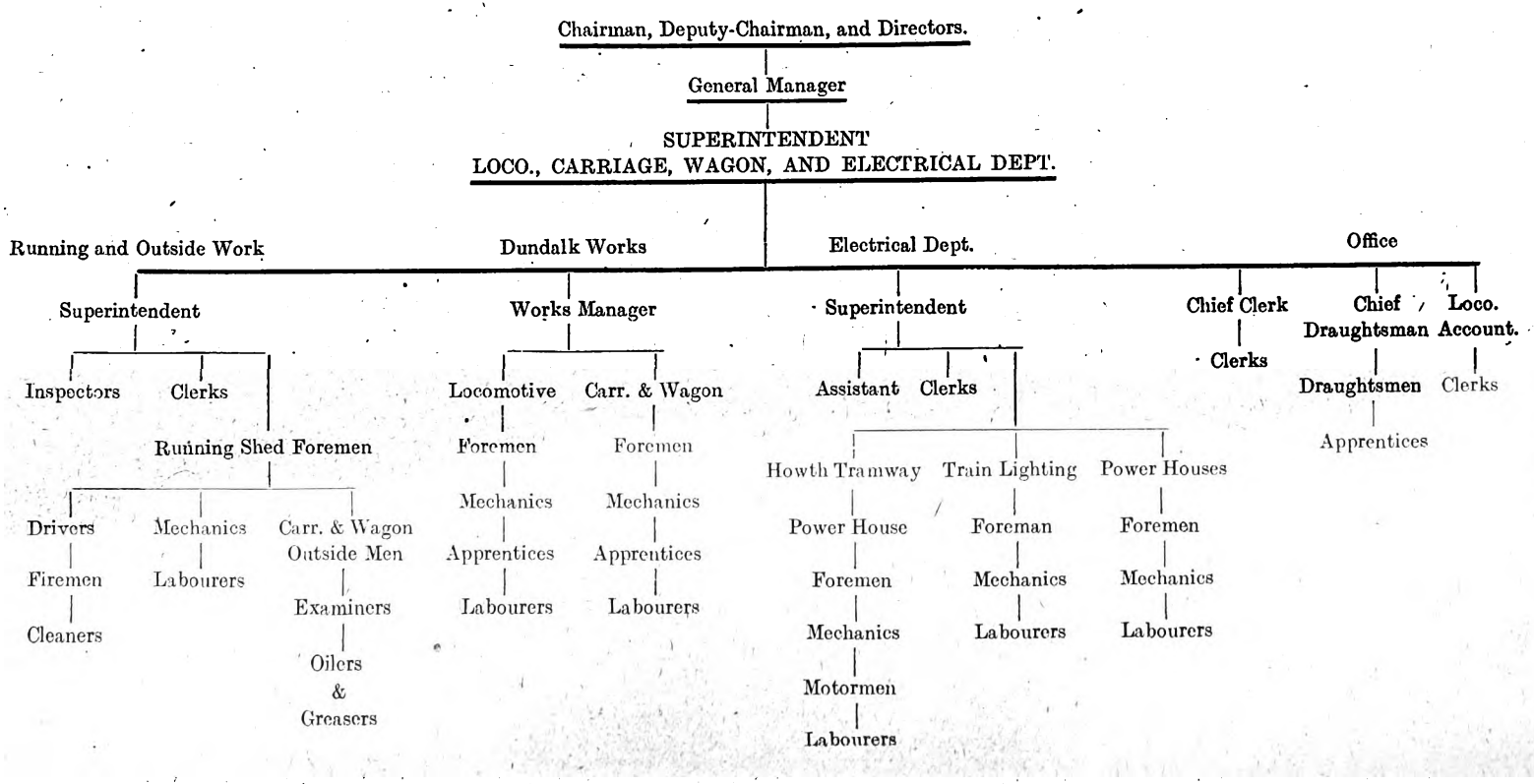
GREAT NORTHERN RAILWAY (IRELAND).



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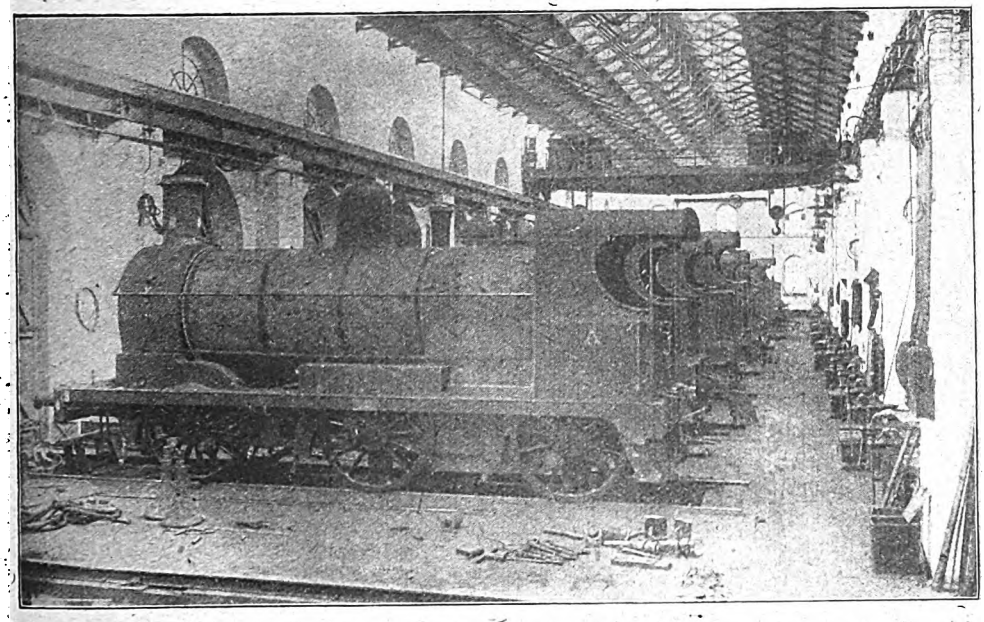
milling machine, a large Kendall and Gent horizontal milling machine, a large duplex vertical boring machine, a Herbert turret lathe, drills and a few other tools.

At the end of the smithy bay alongside is the tool room, approached from the machine shop. Here is a Lumsden grinder, a machine for grinding twist drills, tool racks, gauge cupboards, with micrometer gauges, etc., oil bath for storing pneumatic tools out of use, a repairing bench for pneumatic tools, case-hardening furnace, etc. Alongside the tool room, but reached from outside, is the brass foundry, with cupolas of 80, 120 and 150 lbs. capacity, and usual hand and machine moulding appliances, with a new Morgan tilting furnace recently installed. Next is the coppersmiths' shop, with usual hearths and appliances.

The smithy is 249 ft. long and 39 ft. wide. At the west end is a press for forcing wheels on to axles. Adjacent is a Massey drop hammer (15 cwt.), recently converted from steam to electric drive. Near by is an electrically driven fan for draught, and an oil furnace for the drop hammer. The large 15 cwt. steam hammer is served by another furnace, and along the shop are two smaller hammers, these all taking steam from the boiler house at the end of the machine shop. Twenty-three smiths' fires are distributed about the smithy. At the further end is a new Henry Berry shear and punch, together with spring furnaces, and spring testing plant.

This completes the locomotive section of the works. Though equipment is now sufficiently comprehensive to enable all standard requirements in the way of engine repair and extensive rebuilding, it is necessary to obtain all iron and steel castings from outside, and it has not yet proved practicable to do much in regard to new locomotive building. The last locomotives were built in 1911. Increasing traffic receipts have necessitated, however, additions to engine stock, both in number and size, though the works are barely sufficient for repair requirements. When further extensions can be carried out it may be possible to develop operations in this direction, but meanwhile the shops represent a good straightforward equipment for maintenance and upkeep.



A VIEW IN THE ERECTING SHOP.

On the carriage and wagon side it is, however, the rule to construct as much new material as possible at Dundalk, except that steel underframes and, of course, wheels and axles are usually ordered outside. The wide space opposite the offices and between the two sections of the works is used partly as a wheel yard, many of the wheels being of the steel disc type now used for passenger stock. At present in the open, though it is to be covered in, is a Campbell gas producer (with

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Leading Dimensions of Modern Locomotives: Great Northern Railway (Ireland).

Mr. G. T. GLOVER, M.I.C.E., Locomotive Engineer.

Class	Main Line 4-4-0.	Rebuilt 4-4-0.	Branch 4-4-0.	Main line 0-6-0.	Rebuilt 0-6-0.	4-4-2 tank.
Nos.	170-4, 190-2.	72, 73, 82, 83.	196-200.	175-184.	56 and 59.	185-189.
Cylinders	19 in. by 26 in.	17 in. by 24 in.	18 in. by 24 in.	19 in. by 26 ln.	17 in. by 24 in.	18 in. by 24 in.
Coupled wheels	6 ft. 7 in.	6 ft. 7 in.	5 ft. 9 in.	5 ft. 1 in.	4 ft. 7 in.	5 ft. 9 in.
Bogie wheels	3 ft. 2 in.	3 ft. 2 in.	3 ft. 2 in.	—	—	3 ft. 2 in.
Trailing wheels	—	—	—	—	—	4 ft. 0 in.
Steam pressure	175 lbs. sq. in.	175 lbs. sq. in.	175 lbs. sq. in.	175 lbs. sq. in.	175 lbs. sq. in.	175 lbs. sq. in.
Heating surface, tubes	975 sq. ft.	1,154 sq. ft.	757 sq. ft.	975 sq. ft.	1,154 sq. ft.	986·12 sq. ft.
„ „ firebox	141 sq. ft.	101 sq. ft.	106 sq. ft.	129 sq. ft.	101 sq. ft.	106·0 sq. ft.
„ „ superheater	250 sq. ft.	—	193 sq. ft.	250 sq. ft.	—	—
„ „ total	1,366 sq. ft.	1,255 sq. ft.	1,056 sq. ft.	1,354 sq. ft.	1,255 sq. ft.	1,092·12 sq. ft.
Grate area	22·9 sq. ft.	16·6 sq. ft.	18·3 sq. ft.	22·9 sq. ft.	16·6 sq. ft.	18·3 sq. ft.
Adhesion weight	34 tons	30 tons	29 tons 4 cwts.	48 tons 19 cwts.	38 tons 11 cwts.	33 tons 18 cwts.
Total weight, working order	52 tons 2 cwts.	43 tons 10 cwts.	44 tons 6 cwts.	48 tons 19 cwts.	38 tons 11 cwts.	65 tons 2 cwts.
Weight of tender loaded	30 tons 11 cwts.	28 tons	30 tons 11 cwts.	30 tons 11 cwts.	20 tons	—
Coal capacity	4 tons	4 tons	4 tons	4 tons	2 tons	3½ tons
Water capacity	2,500 galls.	2,500 galls.	2,500 galls.	2,500 galls.	1,550 galls.	1,700 galls.

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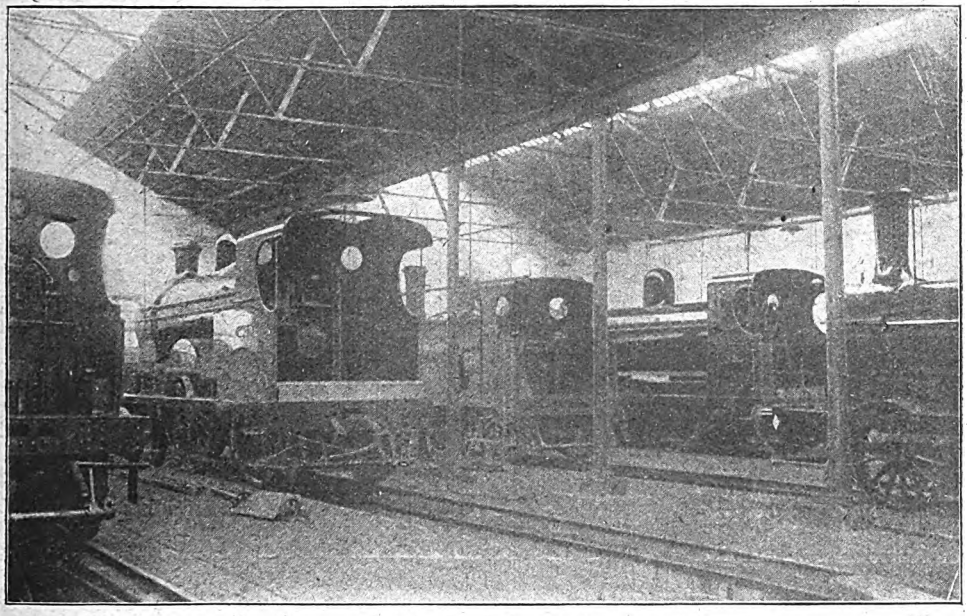
electric drive for the fan) utilising waste timber, sawdust and shop refuse as fuel. Adjacent is the tyre furnace, a series of sectional gas rings suitably curved for various sizes of wheels being placed together according to requirements, the tyres being removed or shrunk on by the aid of gas heating. Elsewhere in the yard wagon iron-work, blanks, and general iron is stored, while nearer the railway may be noted a bar iron store and sub-store.

Attention must now be given to the carriage and wagon building shops, and the saw mill, together with the extension of the latter, in some respects the most interesting of the new departments. The practice throughout Dundalk Works is that attached to every vehicle under construction is a framed diagram showing its type and leading dimensions, together with a board on which is stencilled its number and a few other particulars. These are in addition to the drawings for workmen's use, and accompany the vehicle until it is delivered ready for traffic, besides assisting in the new system of accounts which is a feature at Dundalk. All passenger vehicles now built are of bogie types, and include some interesting designs, a selection of which will be referred to later. On the goods side work done consists mainly of high and low sided open, cattle and box wagons, together



ENGINE PAINT SHOP.

former shop is 160 ft. long and 91 ft. wide and, with the carriage painting and finishing shop on the other side, is served from the carriage traverser which, like that for engines, is electrically operated through wire rope mechanism. There are ten roads, while a through line alongside the new saw mill provides for direct rail access, though this is principally employed for bringing in materials.

In this shop a number of vehicles under construction were noted, including some new bogie vehicles being prepared as set trains for use on the Dublin and Howth suburban services. A feature of carriage with brake vans. The latter include a number of 25-ton six-wheeled vehicles. There are also four bogie wagons for special traffic. Steel underframes are the rule now for passenger stock, and the heavy goods brake vans include a combination timber and steel underframe.

In the old saw mill (91 ft. by 48 ft.), which constitutes an extension of the carriage and wagon building shop, are circular and band saws, a saw sharpener against the wall, a log frame saw against the wall, a planing machine, which previously ranked as the largest in the shop, and a large double vertical spindle moulder used for cutting out

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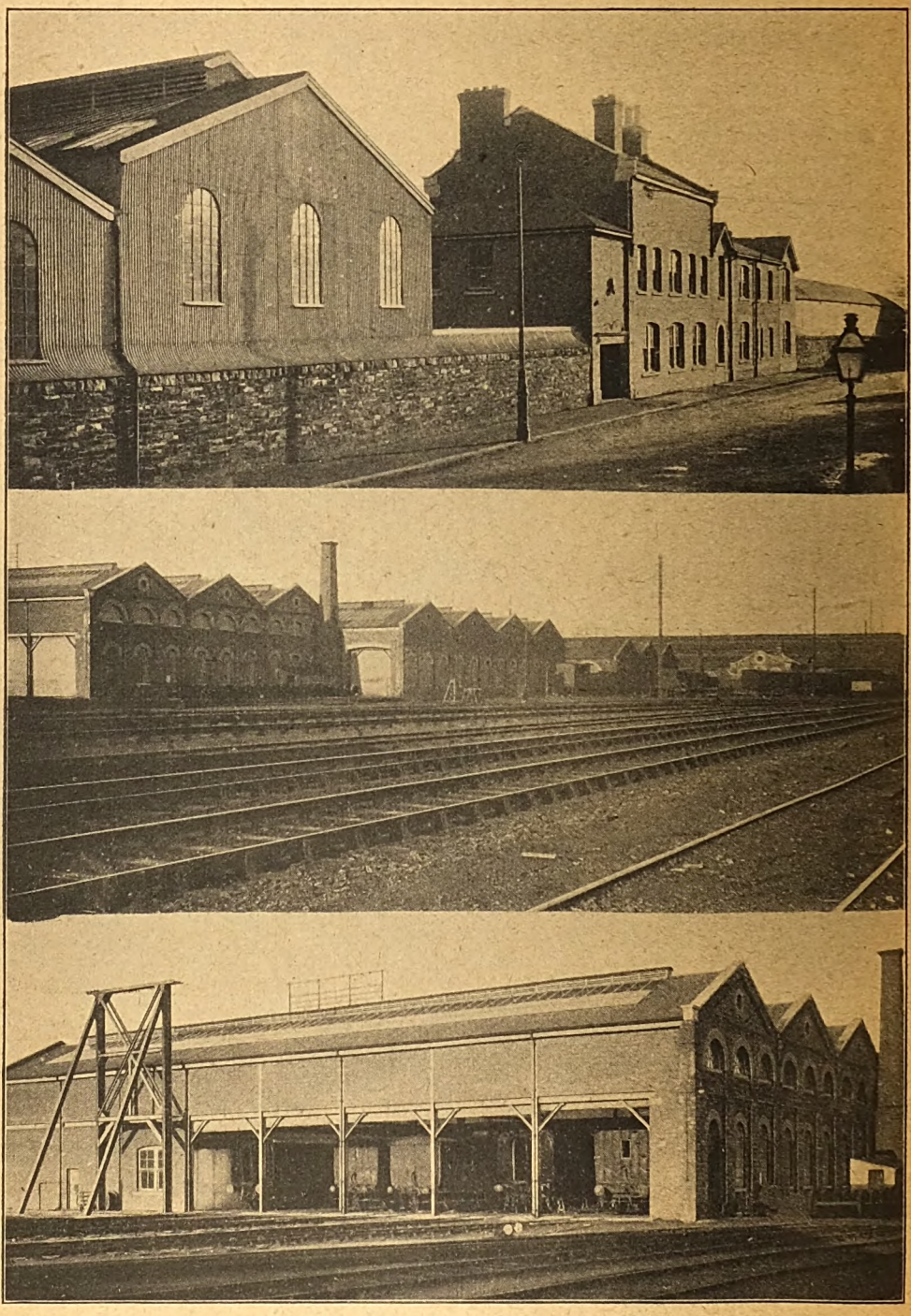

(1) GENERAL VIEW OF OFFICES FROM THE APPROACH SLOPE.
(2) GENERAL VIEW OF WORKS LOOKING NORTH-WEST.
(3) EXTERIOR VIEW OF CARRIAGE SHOP WITH DOORS OPEN.

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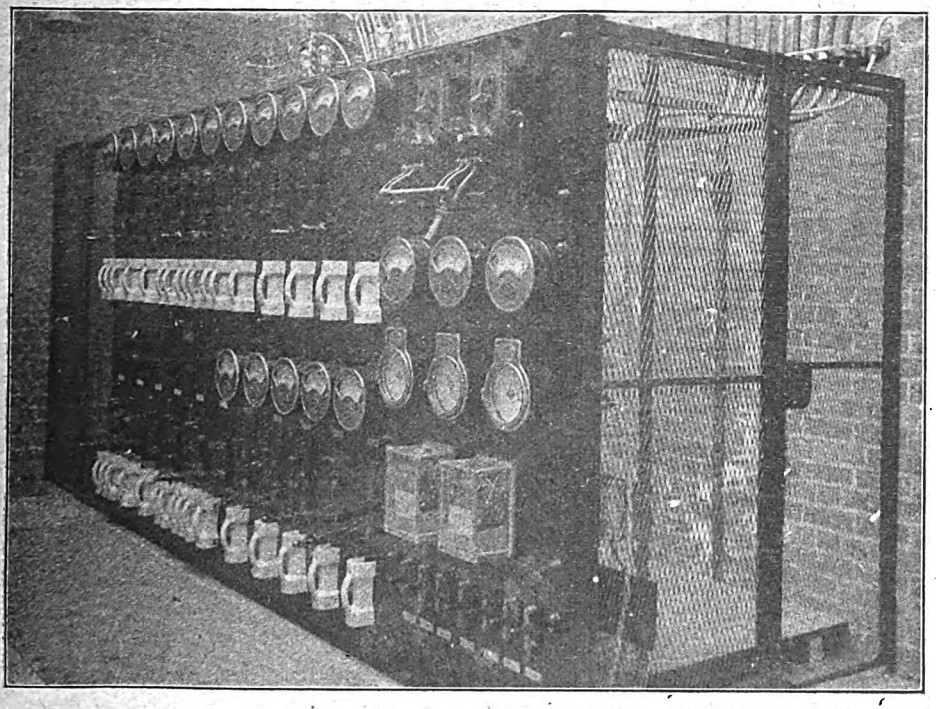
arm rests and other irregularly shaped members.

Built in 1915, the new saw mill is a fine well lighted building. The installation of machines completed in April, 1916, is arranged so that, as far as practicable, timber comes in from the timber yard to a cross-cut circular saw, fitted with gauging rails, where it is cut to length; then passes to the "show" machine of the shop—a big four-side planer, now known as "The Tank," as it will "go through anything"; thence to a boring and morticing machine, equipped with gauging appliances to avoid



SWITCHBOARD IN SUBSTATION.

individual marking off, a device first carried out at Doncaster and which was developed there; and across to a tenoning machine adapted for cutting both ends as required. These are all heavy machines, for dealing with main members of wagon underframes, and for other heavy duties, and most of them are by the well-known firm of J. Robinson and Sons, of Rochdale, whose wood-working machines figure so prominently in nearly all railway shops. Most of these machines are separately motor driven by leather belting, and others are driven from shafting placed under the floor. There is also a Haigh Gruban (Oldham) moulding machine, and an older log frame saw smaller than that in the original saw mill.

The new saw mill is open to the old section, and at the sides next the traverser and that end towards the timber yard are large openings fitted with Kinnear rolling shutters. In fact, wherever convenient all shops are well provided with openings, and these shutters are used in several places.

The large carriage painting and finishing shop, as already explained, replaces the older one burnt down in April, 1913. It is, to all intents and purposes, a new shop, with a portion of the old one utilised at the south end. There are ten roads, and here bodies are erected on underframes, and detail work done. In one of the avenues is a veneering machine (the only instance where gas is utilised), and glue pots provided as required for veneering panels and for general cabinet work. Details of carriage construction are dealt with at the end of one of the bays, and in a division in the corner, but separate from the main shop, is the electrical section, where attention is given to train lighting

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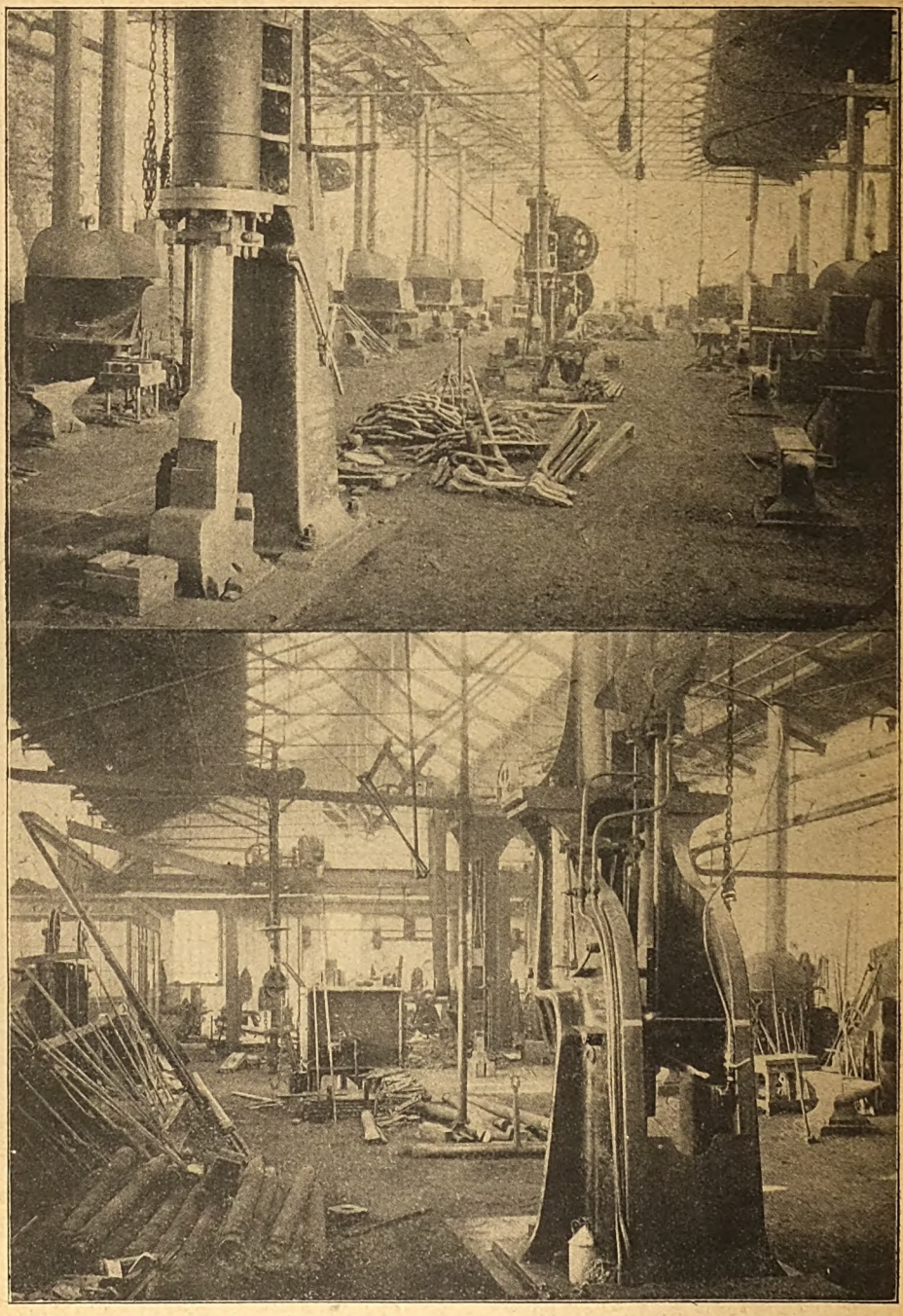

SCENES IN THE SMITHY.

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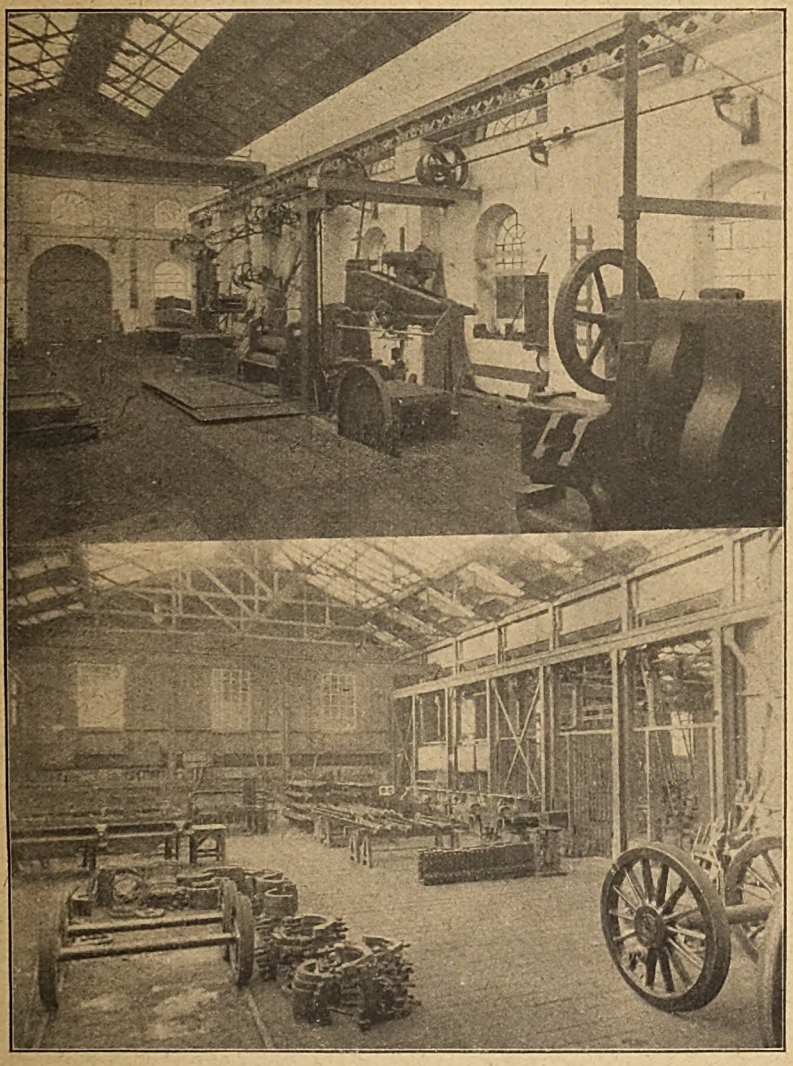
equipment, batteries, washing cells, etc. In a wired-off enclosure electric light fittings are dealt with. Another enclosure is devoted to upholstering, and for polishing work several men and two women, also four women for sewing and upholstering work (the only ones in the shops, though there are several in the offices) are employed. Five of the ten lines are used for carriage repair work.



BOILER SHOP, MACHINE BAY.
FITTING SHOP FOR RODS AND MOTION.

Among vehicles under treatment here were noted some of the new suburban coaches referred to above, and some new composites (three classes and brake van) for single through carriage services. Some of these composites are being fitted with slipping mechanism, as the Great Northern Railway is reintroducing slipping for vehicles detached at Drogheda off Dublin–Belfast trains booked non-stop through from Amiens Street to Dundalk. Mr. J. Bagwell, the General Manager, has specialised in the very fine main line services, a feature of which is his demand for high-class carriages. These vehicles are 58 ft. long, 9 ft. 6 in. wide, and have elliptical roofs, steel underframes, and

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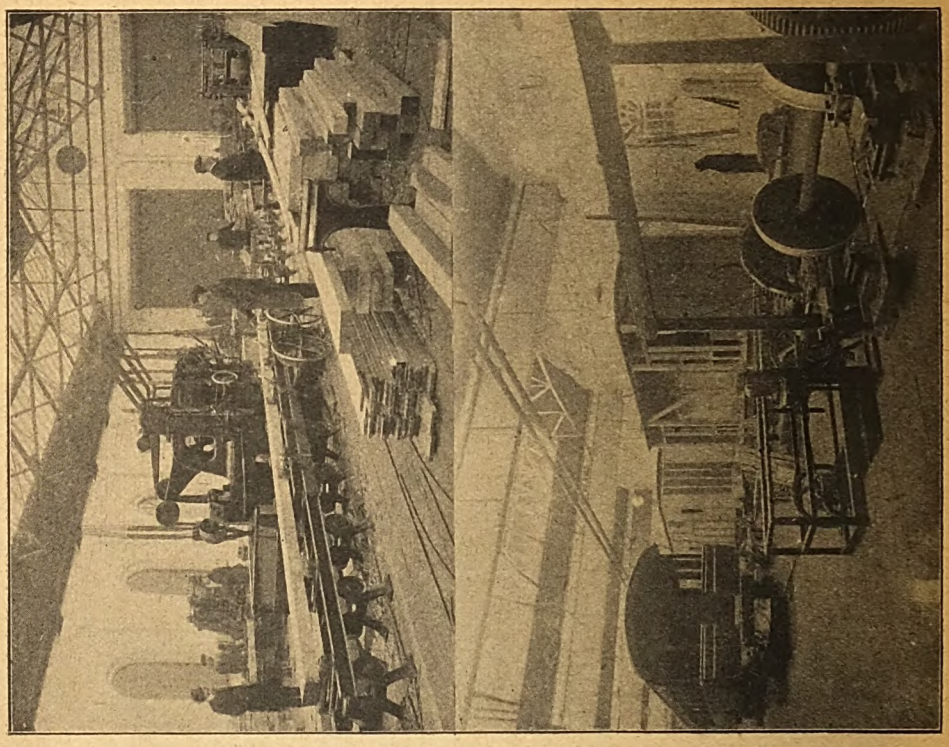
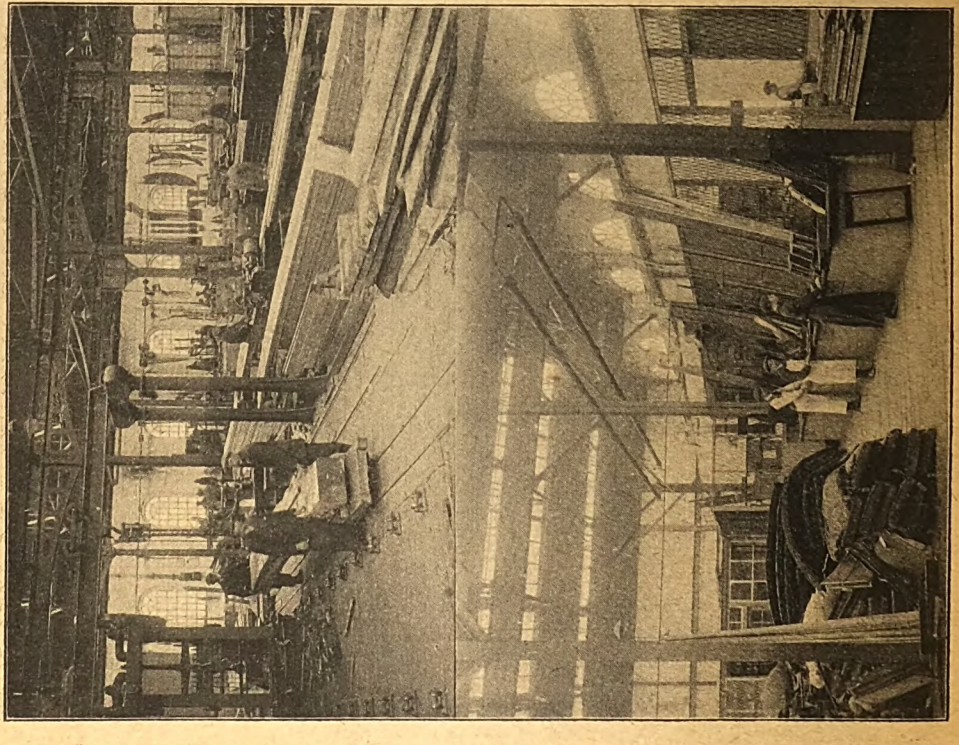


INTERIOR OF NEW SAW-MILL.
CARRIAGE FINISHING SHOP, SHOWING WHEEL LATHE.



SAW-MILL, OLD, LOOKING NORTH-EAST.
CARRIAGE FINISHING SHOP, SHOWING TRIMMERS' AND POLISHERS' BENCHES.

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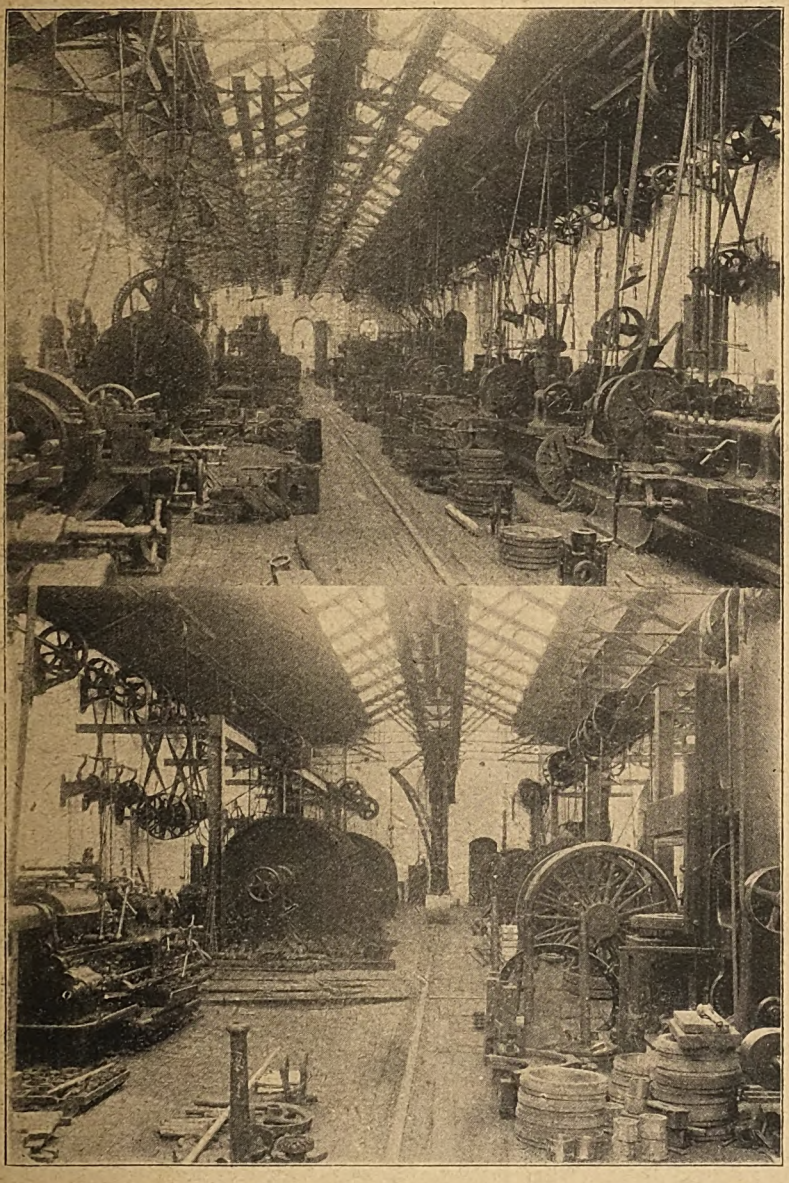
10 ft. wheelbase bogies. Brake vans now have sliding doors fitted with Hoffman ball bearings. Emergency tool cabinets are placed in brake vans for use in the event of accident. All new vehicles are equipped with Spencer double-buffers, the first impact and the ordinary pressure being taken up by one set of springs, further compression forcing back an annular plunger which brings the main springs into action.

Bogies are dealt with in the wider portion of the shop, being fitted up there. Adjacent is a wheel lathe, with its own motor, for turning up wheels brought with bogies into this shop, so that it is not necessary to send them into the main shops unless further attention is required. This lathe is placed parallel to the track entering the shop, as that line also served for moving bogies in and out, and for delivering to the wheel lathe a



VIEWS IN THE MACHINE SHOP.

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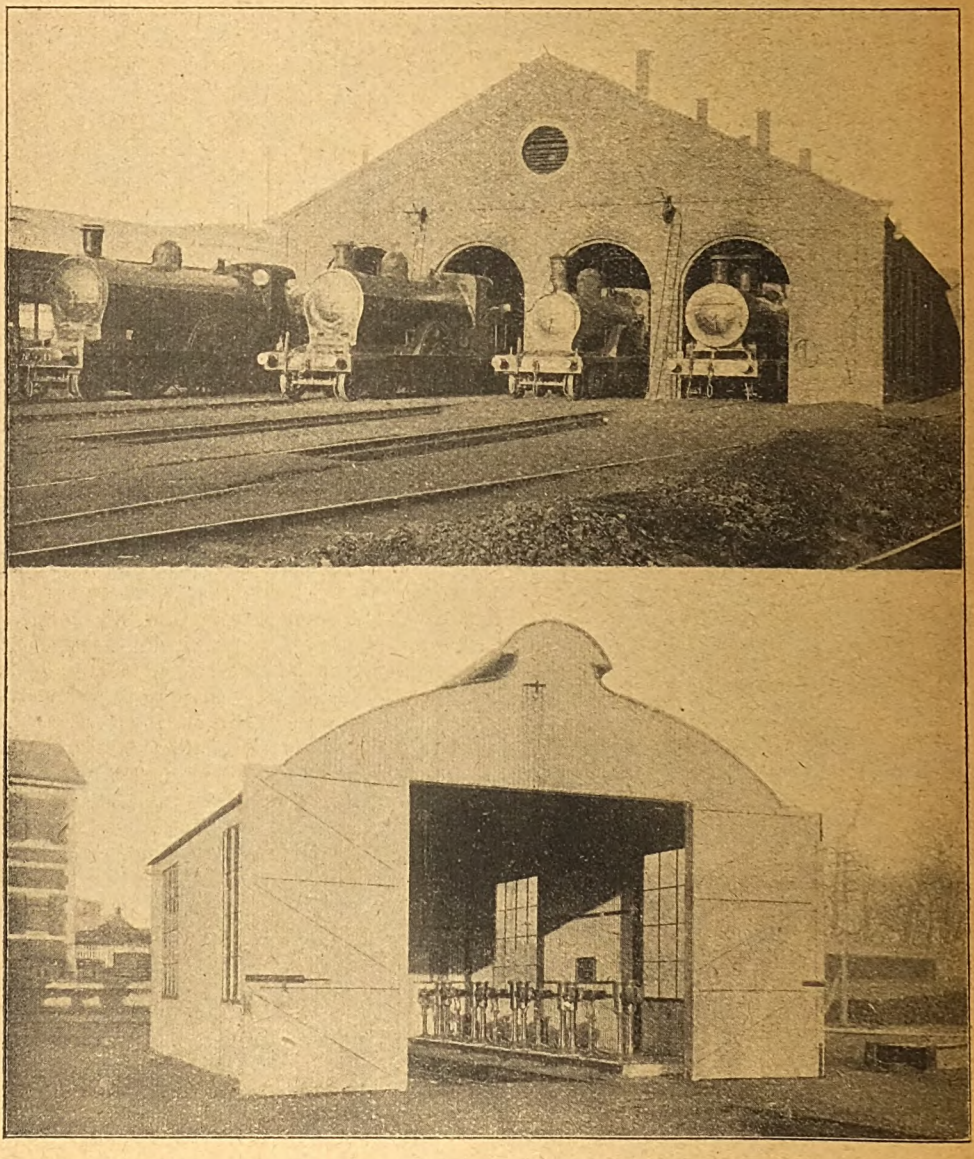
jack is fitted between the rails whereby wheel axles can be lifted and turned at right angles to the lathe. The building is heated by steam, the boiler for which is placed in a small enclosure just outside the bogie track entrance.

to permit of this, so that as remodelled there are five roads giving direct access at the south end. It may here be noted that the tracks in the yard include two curves more severe than any on the system, so that their



RUNNING SHED, EXTERIOR.
ENGINE WEIGHBRIDGE AND HOUSE.

Before long vehicles were introduced the carriage traverser afforded the usual means of bringing vehicles into and out of this shop, but main line coaches are now too long

passage ensures that vehicles can go anywhere on the railway.

Further south is the carriage litting and repair shop, 145 ft. long and 70 ft. wide.

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This has four tracks, and is used mainly for lighter repairs. It is a timber erection, whereas the new buildings are of red brick, and the older ones are usually of substantial construction. At this end the works are located on reclaimed land, and part of the yard is of a made-up character, in view of extensions contemplated in this direction. One section of the yard constitutes a store for boilers made to stock, while another section is used for cutting up old boilers and engines and as a scrap yard for old wagons. Adjacent log timber is stored. This area is also served by a made road affording cart access to the works, a weigh bridge being provided near the entrance.

The main timber yard is in line with the new saw mill, and at the side are two large timber sheds where planks of various woods and qualities are stored for seasoning, with a number of standard members partly machined for use as required. These sheds have railed walls to allow free air draught. A section is divided off to form the main pattern store, and this is, of course, fully enclosed.

On the east side of the main line is the wagon repairing and lifting shop. This is 500 ft. long and 37 ft. wide and has two lines through. It is served at two places from three outside lines by hand-operated wagon traversers. One of these lines has, further, a weigh bridge.

Beyond the wagon section is the running shed, 260 ft. long and 60 ft. wide, with four lines, each for five tender engines, and equipped with smoke and draught troughs as usual. Beyond the turntable is a weigh house, containing a recent five-table Pooley machine, which is exactly the same as that used at Crewe Works. Outside is a lifting gantry for removing wheels from engines. The turntable is 60 ft. in diameter. Beyond are coal sidings, but the first road is used for old engines waiting to be broken up.

Across the Barrack Street line is the general store. This has two floors, and each is laid out in bays for the various items. Outside forgings and the like are dealt with here, unless it is preferable to send them direct into the works for immediate use. There is also a great deal of other material for the works, though the stores also serve the general requirements of the railway. Outside is a bank for loading up stores vans.

At this stage it will be of interest to note the organisation now adopted on the Great Northern Railway, and in this connection a diagram on page 166 is reproduced by permission of Mr. Glover.

The locomotives under Mr. Glover's supervision number 204, with 170 tenders, and these are classified as follows:

TENDER ENGINES.	
2–4–0	9
4–4–0	75
0–6–0	86
	170
TANK ENGINES.	
4–4–2	5
4–4–0	13
2–4–2	6
0–6–4	4
0–6–2	4
0–6–0	1
0–4–0	1
	34
Total ..	204

Passenger train rolling stock consists of 262 carriages of uniform class, 116 composites, 5 restaurant cars, and 2 miscellaneous vehicles, together with 8 post office vans, 62 luggage, parcels and brake vans, 45 carriage trucks, 100 horseboxes, and 88 vehicles, making 688 in all, of which, for the present, nine have been utilised to form an ambulance train to War Office instructions. For the electric tramway to Hill of Howth there are 10 passenger cars and one goods car.

On the goods side there are 594 open wagons under 8 tons, 1,788 from 8 to 12 tons, 3 between 12 and 20 tons, and 2 special trucks. Covered wagons include 203 under 8 tons, 2,299 between 8 and 12 tons, and 30 over 12 and up to 20 tons. There are also 653 cattle trucks, 122 rail and timber trucks, 103 brake vans, and 14 miscellaneous wagons. In addition, for service purposes, there are 100 locomotive coal wagons, 147 ballast wagons, 9 mess and tool vans, 2 breakdown cranes, 13 travelling cranes, and 24 miscellaneous vehicles; 28 horse wagons and carts are also utilised.

Present standard main line express engines are of the 4–4–0 type, fitted with superheating apparatus. These first appeared in 1913, soon after Mr. Glover took charge at Dundalk. One of them formed the subject of our colour plate in September, 1913, but whereas No. 174 *Carrantuohill* then ran in the green livery standard at the time, all these engines are now painted in black, neatly lined out in red, realising a very satisfactory

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result. The first five were Nos. 170 *Errigal*; 171 *Slieve Gullion*; 172 *Slieve Donard*; 173 *Galtee More*; 174 *Carrantuohill*. Three newer engines since added are Nos. 190, 191, 192.

Since these engines were placed in service the principal business express trains between Dublin and Belfast have been accelerated, the principal ones to 2 hrs. 35 min. or 2 hrs. 45 min. down, with stops at Drogheda (31¾ miles in 39 min.), Dundalk (22½ miles in 28 min.), Portadown (33¼ miles in 44 min.), and Belfast (25 miles in 35 min.). The up "Limited Mail" does the journey in the even 2½ hours. As the loads are considerable, and the grades not easy, particularly between Dundalk and Portadown, this is notable work.

For branch traffic Mr. Glover has introduced a smaller 4–4–0 class, with coupled wheels 5 ft. 9 in. in diameter, illustrated and described in the September, 1915, number of the RAILWAY MAGAZINE. The boiler is, however, a somewhat smaller one, though it is fitted with Robinson superheater, and the design has been prepared to permit of a larger boiler being fitted when found desirable. At present several sections of the Great Northern system are restricted to weights of 14¾ tons per axle, but as the engineering department takes them in hand these are gradually being strengthened, so that in due course heavier engines will be able to work all routes.

For heavy main line traffic, Mr. Glover introduced his well-known superheater goods engines, one of which is illustrated. He has also rebuilt some of the older 4–4–0 and 0–6–0 engines with larger boilers, and is about to rebuild one of the earlier classes, 4–4–0 type, fitted with superheater. Two of these rebuilds classes are illustrated on the frontispiece to this article, and dimensions of all engines referred to are given on page 168 in tabular form. Mr. Glover's 4–4–2 tank engines, introduced in 1913, work stopping trains between Dublin (Amiens Street) and Dundalk, as well as between Amiens Street and Howth. Further additions are being made, and these will have Robinson superheaters.

Besides Mr. Glover's own engines, there are also Mr. Clifford's later 4–4–0 and 0–6–0 designs on main line work and a number of older classes on branch and lighter duties; but many of the latter are now finding their way to the scrap-yard, after many years' service.

New passenger rolling stock on the Great Northern Railway is all of bogie design, with a standard body length of 58 ft., and width 9 ft. 6 in., as permitted by the Irish gauge. In fact, on the Great Northern system still greater width would be practicable, but running arrangements over other lines have to be taken into account.

As a general principle, main line coaches are of the centre passage-way type. In first and second class vehicles compartments are separate, but connected by either-way swing doors. Thirds are usually in groups of two or three compartments, open above the luggage racks and with centre gangways, only certain compartments having outside doorways. Glass louvre ventilators, frameless lights, and large observation windows are characteristic of new rolling stock, and the later restaurant cars are very fine vehicles. High elliptical roofs are standard, and in the varnished mahogany livery now adopted the coaches present a fine appearance. Vans are built to correspond with the main line vehicles, and there are also composites for all classes and luggage for such services as the through coaches between Dublin and Oldcastle. Some of these composites, also a few other vehicles, are of side corridor type, but the central passage way principle is mostly favoured.

Goods rolling stock include high and low sided open wagons, rail and timber trucks, box wagons, cattle wagons, and bogie wagons for carrying long timber.

Some of the goods brake vans include one or two passenger compartments, as it is usual to allow drovers to travel by certain cattle trains to and from the numerous markets served by the railway.

Under Mr. Glover's jurisdiction is the Hill of Howth electric tramway, of which Mr. Whieldon has direct charge as electrical engineer.

Mr. G. T. Glover, M.Inst.C.E., Locomotive, Carriage and Wagon Superintendent, was educated at Lancing College and at the Royal School of Mines. He served his apprenticeship with Messrs. James Simpson & Co., London, and Messrs. Neilson & Co., Glasgow. Leaving the latter firm, he entered at Gateshead, in 1894, the service of the North Eastern Railway as draughtsman, and was afterwards in the Testing of Materials and Boiler Inspection Department. Subsequently he was with Mr. D. Bain at York, and in 1901 was appointed Manager of the Carriage and Wagon Works at Walker Gate. In 1903, under Mr. V. L. Raven, he was given charge of all electrical carriage stock on the Tynemouth electrification, both running and maintenance (electrical and

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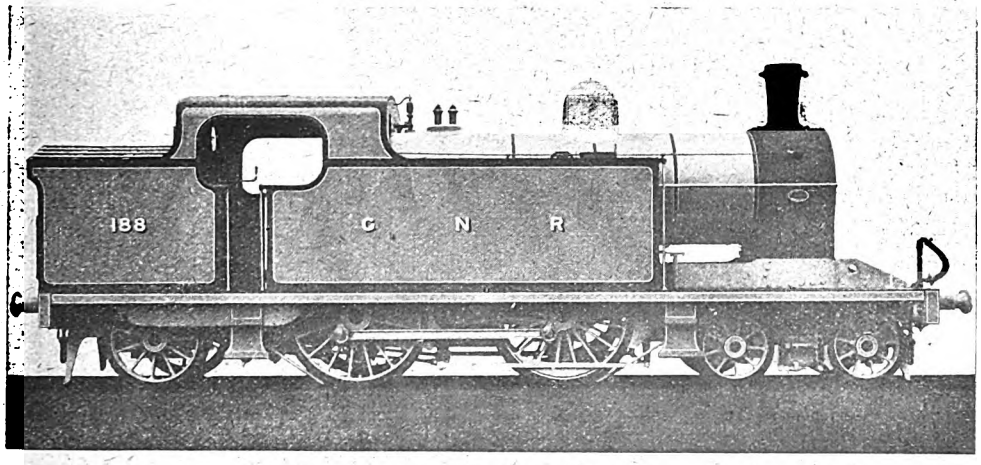
otherwise). Afterwards appointed Manager of Shildon Wagon Works, Mr. Glover in 1909 went to Gateshead Locomotive Works as Manager. His present position dates from 1912.

Mr. A. W. Denniss (M.I.M.E.), Running Superintendent, was educated at Rossall School. Apprenticed with the North Eastern Railway in the Gateshead locomotive shops, he was subsequently engaged in the locomotive drawing office, York, and as Inspector on the Chief Assistant Mechanical Engineer's staff at Darlington. He became District Locomotive Superintendent of the Ceylon Government Railways in 1902, but returned to take up his present position in 1909.

Mr. A. W. Whieldon (M.I.E.E.), Electrical Engineer, was educated at Nottingham University College, afterwards entering the service of Messrs. Farmer, Roby & Co., mechanical engineers, Gainsboro', as a pupil. Some years were then spent first as an improver and then as a draughtsman with various engineering firms. He obtained a position as assistant on the engineering staff of the City of London Electric Lighting Company and installed various electric tramway systems for the British Thomson-Houston Company. Later he was appointed Managing Engineer to the Kidderminster and District Electric Lighting and Traction Company. In 1901 he joined the Great Northern Railway, primarily with the Hill of Howth electric tramway, and his department has since been extended to cover the whole of the electrical engineering of the company.

Mr. G. H. Raeburn, Locomotive Accountant, joined the Great Northern Railway service as an apprentice clerk in 1892, and became Chief Clerk at Drogheda Goods in 1899. He served in the Dublin Yeomanry in the Boer War, and returned from South Africa with the Queen's Medal and 5 Clasps, a commission being offered him. After the war he rejoined Great Northern service and was promoted Passenger Relief Clerk. He was then given charge of the Goods Manager's staff, Accounts Department, at Grosvenor Street, Belfast, to inaugurate a new system, and in 1915 was given his present position.

Mr. R. Wild, Works' Manager, served an apprenticeship at Carlisle. After experience in various engineering shops, he joined the Great Northern Railway at Dublin in 1876. He was appointed Chief Draughtsman at Dundalk when the new works were built there in 1881, and in 1892 became Works' Manager.



MAIN LINE TANK ENGINE NO. 188.
Designed by Mr. G. T. Glover, Locomotive Engineer.

Mr. J. W. Jennings, Chief Clerk, was first with the Midland Great Western Railway, and served in all branches of the Traffic Department, and later was given an appointment on the headquarters' staff. Subsequently he was Chief Assistant to the late Mr. D. J. Stewart, manager and part-owner of the Dublin and Manchester Steam Shipping Company. From thence he entered the service of the Great Northern Railway. His present position dates from 1912.

Mr. L. J. Watson, Chief Draughtsman, joined the service of the Great Northern Railway as an apprentice in 1879, and was transferred to the Drawing Office as draughtsman in 1887. He was appointed Chief Draughtsman in 1892.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.

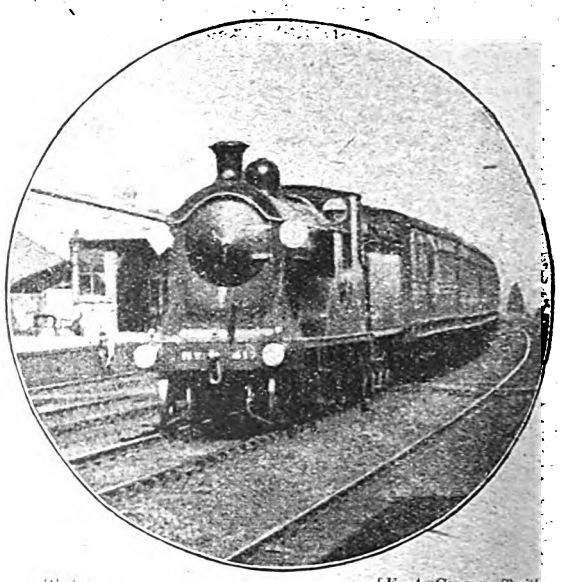

Photo. [*E. A. Gurney Smith.*

LONDON AND SOUTH WESTERN RAILWAY.
Express passing Earlsfield.
4-4-0 locomotive No. 417.

THE Editor dealt so exhaustively in the last issue with the epoch-making time-table changes which the New Year ushered in that but little remains for me to say concerning them. On the whole, I prefer not to dwell on the melancholy question of deceleration, which in its scope and effect, as demonstrated in the new time-tables, carries us back over decades, but rather to direct attention to certain timings which seem, for one reason and another, to have escaped the general *débâcle*. There are some of these left, fortunately, on almost all the large lines, so that it is still possible on one's business journeys, by a careful choice of route and train, to find material for the "log" book that is not altogether uninteresting or unworthy of note.

On some railways, indeed, the alterations are considerably fewer and less drastic than on others, as, for example, the London and South Western, the Great Central, the Great Eastern, the North Eastern and the Lancashire and Yorkshire. On the first-mentioned a number of the "crack" bookings remain in force, as the 11.0 a.m. and 3.25 p.m. trains from Waterloo to Plymouth; and the corresponding return expresses due in London at 3.26 and 8.7 p.m., together with the 2.10 p.m. from Exeter to Waterloo, which makes the fastest start-to-stop run on the London and South Western Railway—Basingstoke to Vauxhall, 46¾ miles, in 49 min. Although further important trains have disappeared from the Bournemouth service, also, including the 10.15 a.m. *ex*-Waterloo (as far as Eastleigh), and the 4.10 p.m. from Weymouth to Waterloo (running non-stop from Southampton West to Vauxhall in 90 min.), there are still some good bookings, such as those up from Winchester to Vauxhall by various trains in 76, 77 and 79 min., for a distance of 65½ miles.

Against this the revisions on the other two southern lines have been drastic in the extreme, the fastest time between London and Brighton being now 70 min., with the sole exception of the midnight down express, which does the journey in 65 min. Eastbourne has one good train left in each direction, the 8.30 a.m. up continuing to run to London Bridge (without a Victoria slip connection) in 93 min., inclusive of stops at Lewes and Balcombe, while the 5.5 p.m. from London Bridge reaches Eastbourne in 95 min.—5 min. more than previously—with a stop at Lewes. The South Eastern and Chatham has practically no decent schedules left except, strangely enough, quite a brilliant little "snippet" on the morning express from Folkestone, which covers the 35¾ miles from Sandling Junction to Tonbridge in 41 min.—average 52·3 m.p.h.

On the Great Eastern Railway practically all the modifications are confined to extra stops in replacement of slip carriages, or in compensation for the cancellation of semi-fast trains, most of which were introduced in the "radical alterations" time-table of October, 1911. But many trains are absolutely

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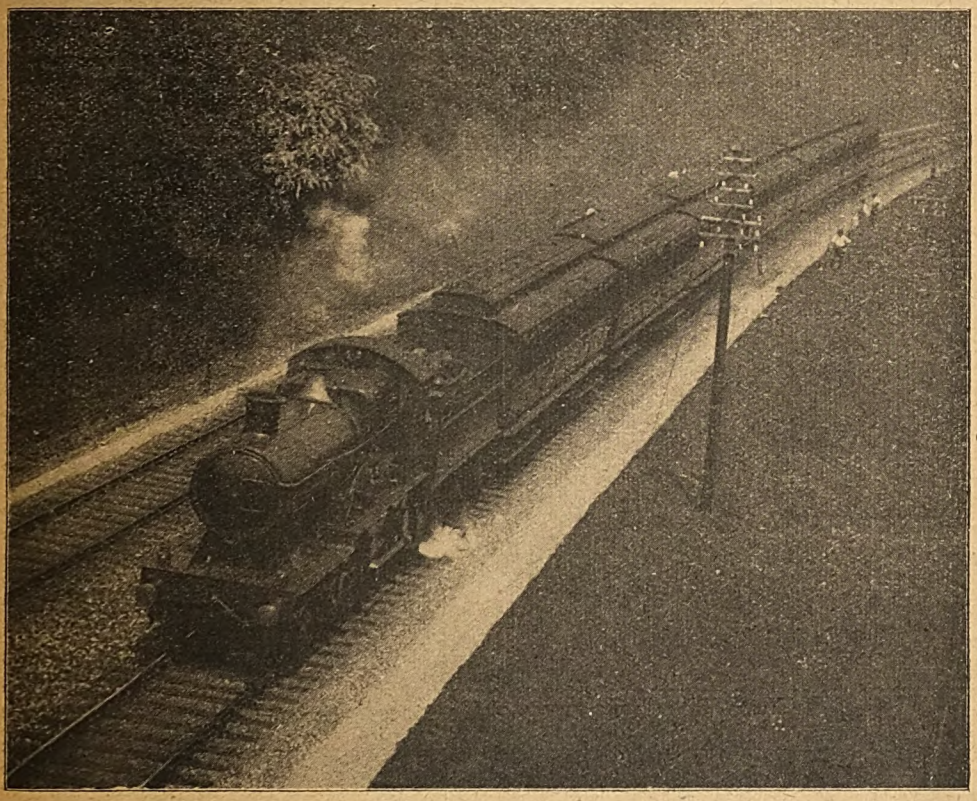
untouched, the Cambridge line tables, for example, showing practically no alteration, save for the loss of the St. Pancras services and the down evening expresses from Liverpool Street at 7.2 and 8.58 p.m., while on the Colchester line several of the best bookings remain, as Ipswich to London in 86 min., and the return journey in 87 min., Mark's Tey to London in 58 min., and Witham to London in 50 min. Southend branch times are mostly increased by 2 or 3 min., but the most brilliant of them all—Shenfield to Rochford, 18½ miles, in 21 min., average 53 m.p.h.—is still scheduled by the 12.10 noon from Liverpool Street, and is the fastest start-to-stop time on the Great Eastern Railway.

The other eastern line—the North Eastern—has some strange anomalies in its time-table, on which the principal East Coast trains are practically the only ones decelerated. So the 8.0 a.m. from Newcastle to London is still booked to run from Darlington to York, 44·1 miles, in 47 min., while the corresponding return train retains its 45 min. schedule over the same stretch, this being now the fastest point-to-point booking in the country. I was pleased to note, on a run with this train a few days ago, that schedule time was exactly kept, while on an up run with one of the decelerated Anglo-Scottish expresses a gain of nearly 7 min. on schedule time between the same points left an actual time of almost exactly 49 min.—the previous booking—despite a load of well-nigh 500 tons all told. Another smart time is that from York–Northallerton, 30 miles, in 34 min., on the 4.55 p.m. train. It is rumoured, however, that the North Eastern time-tables, as well as those of the Lancashire and Yorkshire Railway, which latter have been practically unaltered since the last set of decelerations, are to receive further attention shortly, and quite possibly they may have done so before these lines appear in print.

On the Great Central Railway, despite



Photo] [*Reginald Walker.*

GREAT WESTERN RAILWAY.
Bristol–Salisbury Express near Limpley Stoke.
4–4–0 locomotive No. 4153, *Camellia.*

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considerable alterations, there still remain some very fast timings. The 2.35 a.m. down "Newspaper," now a much less brilliant version of its former self, and the 8.45 a.m. from Marylebone both run from Rugby to Leicester, 19⅞ miles, in 21 min.—average 56·8½ m.p.h., and the 6.10 p.m. down from Woodford to Leicester, 34 miles, in 36 min.—average 56·7 m.p.h. Similarly the 2.15 p.m. from Manchester to London, while adding a minute on most sections, and 2 min. from Leicester to Woodford, is actually accelerated between Brackley and Marylebone, covering the 59¾ miles, including the difficult grades of the Metropolitan line, and slacks at Grendon, Quainton Road, Ricksmanworth and Harrow, in 66 min., an average speed of 54·3 m.p.h., and arriving only 4 min. later than heretofore. The 12.15 p.m. from Marylebone to Manchester covers the 27¾ miles from Princes Risborough to Brackley in 30 min., average 55·5 m.p.h. Various other smart timings remain, in most cases increased from point to point by one or two minutes, but as a certain amount of competitive traffic is likely to be diverted in future on to the Great Central Railway, the increasing weight of trains will probably render these minutes useful.

It is interesting to note that the Great Central Company now runs in the 3.15 p.m. down the fastest train from London to Leicester by 14 min., to Nottingham by 19 min., and to Sheffield by 48 min. The 2.15 p.m. up from Manchester is similarly the fastest train from Sheffield by 25 min., by Nottingham by 11 min., and from Leicester by 6 min. to Marylebone. Even as regards Manchester the quickest down London and North Western train takes the same time as the Great Central 3.15 p.m., and the quickest Midland 5 min. less, while on the up journey the conditions are reversed, the fastest London and North Western taking 6 min. less than the Great Central 2.15 p.m., and the fastest Midland up 4 min. more.

Of the London and North Western and Midland services but little can be said. The latter include practically no good times at all, with the possible exception of those over the Settle and Carlisle section, where, in view of the loads that will probably be conveyed, such times as 110 min. from Skipton to Carlisle (86¾ miles) and 100 min. from Carlisle to Hellifield (76¾ miles) are not to be despised on such trains as the 9.15 a.m. expresses from St. Pancras and Glasgow respectively. On the London and North Western Railway fast running is confined principally to the Irish boat trains, the 8.30 a.m. and the 5.20 p.m. *ex*-Euston retaining unaltered times. As the last-mentioned train has for some months conveyed an *average* tare load daily of 430 tons, to cover the 133½ miles to Stafford in 150 min. requires some very fair pulling. On the Chester and Holyhead line such fast timings are retained as 122 min. from Crewe to Holyhead and 124 min. in the reverse direction (105¾ miles, including the exceedingly bad slow through Chester), and also 93 min. for the 84½ miles from Chester to Holyhead.

On the Great Northern Railway the only respectable schedule left is that of the 5.30 p.m. from King's Cross to Newcastle, which has added only 4 min. between London and Grantham, and with its nightly minimum load of 14 bogies does not find it easy to perform this 105½ miles' run in 125 min. Indeed, on the last two occasions on which I have travelled by it, drivers have carefully observed the new timings of the principal Scottish trains, taking 2 hrs. 18½ min. on the one occasion, and 2 hrs. 19 min. on the other. But these losses are largely due to the tremendous time that drivers of down-trains take in getting through Finsbury Park, the rails through Maiden Lane and Copenhagen Tunnels being invariably slippery, and giving the "Atlantics" a good deal of trouble. There seems no reason why these heavy trains should not be "banked" in rear out to Finsbury Park—an operation that would be attended with no danger provided that the trains were not allowed to start until the line was clear to Finsbury Park North Box.

The 93 and 95 min. bookings up from Peterborough also, can become decidedly difficult with loads rising, as on a recent run sent me by a correspondent, to 16 large 8-wheeled corridor cars and a 6-wheeler, when No. 1401 did excellently to complete the journey in just over 93 min. One unaltered timing on the Great Northern Railway, by the way, is that of the 5.0 p.m. *ex*-King's Cross, which is still expected to reach Cambridge in 75 min., with two intermediate stops, and Peterborough in 99 min. with three stops, one of 5 min. duration. The latter schedule includes timings of 29 min. for the 27 miles from Hitchin to Huntingdon, start-to-stop, and only 23 min. for the 17½ miles thence to Peterborough, including the negotiation of Ripton summit, and a stop at Holme—a really difficult feat, even with a light load. The Cambridge portion, also, is very smartly timed. Lastly, the "Mark Lane Cannon Ball," as the train reaching

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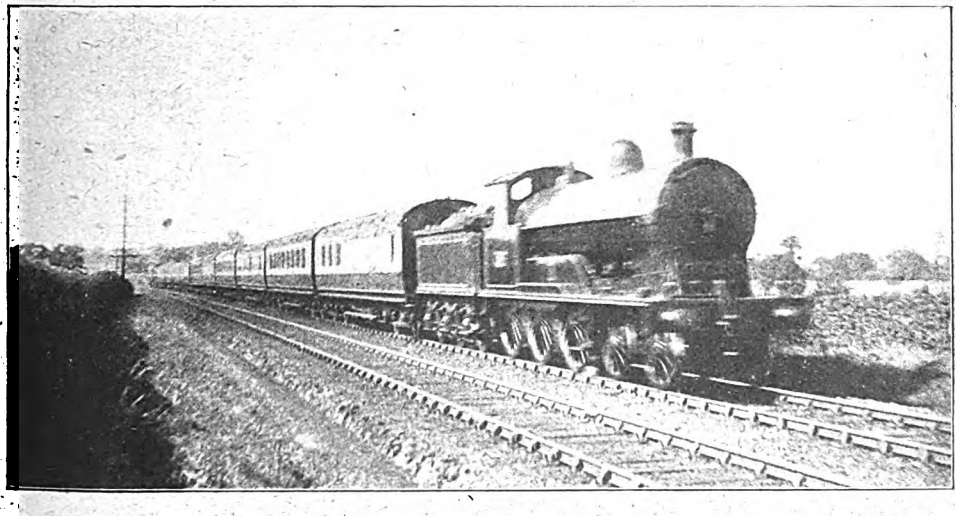
King's Cross at 10.40 a.m. used to be known, retains its timing of 80 min. for the 74 miles from Peterborough to Finsbury Park, but now runs on Mondays only.

One of the best remaining time-tables, drastically cut down though it is, is that of the Great Western Railway. The new 10.15 a.m. *ex*-Paddington, replacing the "Cornish Riviera Limited," and also probably taking many passengers who would otherwise have travelled to Exeter and Torquay by the now cancelled 12 noon train, reaches Taunton in 160 min.—only 10 min. slower than the previous best time of 2½ hours, despite a stop at Westbury in place of slipping. A time of 104 min. is taken for the first 95½ miles to Westbury, while the next 47½ miles to Taunton are allowed 55 min.—in each case start-to-stop. The Sunday 2.45 p.m. down does the journey to Taunton non-stop in 155 min.—average 55·2 m.p.h. In the reverse direction the new train due in Paddington at 5.20 p.m.—a slower version of the up "Riviera," is allowed 164 min. from Taunton non-stop, while the Sunday up West of England express due in Paddington at 7.45 p.m. takes 55 min. from Taunton to Westbury, and 108 min. thence to London. Should loads be very heavy, as is probable, these will all be none too easy bookings, despite the proven capacity of the Great Western 4–6–0 engines for brilliant work with prodigious trains.

The Bristol non-stop time is increased to 2¼ hours, but only the 12 noon up train, and the 4.15 p.m. down and 4.45 p.m. up on Sundays, now run without intermediate stops. The first mentioned, however, will probably load a good deal more heavily than hitherto, owing to the diversion from Taunton to Bristol, except on Mondays, of the train hitherto running *viâ* Westbury, and due in Paddington at 1.30 p.m. A Reading stop is retained in the 2¼ hours' schedule to Bristol of the 1.0 p.m. (late 1.5) down, which now covers the 81½ miles thence to Bristol *viâ* Badminton in 89 min., and will also carry a heavier load owing to the withdrawal of the 1.30 p.m. Cornish express from Paddington. The new time of the late 5.5 p.m. from Bristol, now 4.45 p.m., is 2¼ hours, and includes a Reading stop instead of slipping, the allowance to Reading being 91 min. Owing to the closing of Box Tunnel for repairs, the "Bath Spa" down express is diverted from Thingley Junction, Chippenham, *viâ* Melksham, and takes 132 min. for the 115½ miles' journey by this route. But as the new 4.0 p.m. West of England express (late 4.15) takes 3 min. longer for the journey, and yet is allowed only 99 min. for the first 94¼ miles to Chippenham, it may be assumed that the 11.0 a.m. is equally smartly timed. The 6.30 p.m. down is allowed 101 min. to Chippenham. From Bath to London the best time is by the 9.30 a.m. on Mondays, completing the journey in 130 min.

In other directions there is not much left on



Photo] [*W. K. Smith.*

LONDON AND NORTH WESTERN RAILWAY.
Birmingham–London Express near Stechford.
4–6–0 superheater engine No. 95, *Gallipoli*.

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MIDLAND RAILWAY: MANCHESTER–LEICESTER.

Distance (miles).	Run No.		Schedule (min.).	1	2	3	4	5	Distance (miles).	Schedule (min.).	6	7
	Train *ex*-Manchester			12.0 NOON							7.30 A.M.	
	Engine 4-4-0 No.			1013	1013	1012	1020	1013			†1014	‡706
	Engine class			4 (4-4-0 COMPOUND)							4	3
	Load. To Cheadle Heath' (*Ex*-Derby, Runs 6 & 7)	Axles		24	28	28	28	24			*22	*20
		Tons		160	185	180	180	160			*135	*125
	Load. *Ex*-Cheadle Heath (*Ex*-Derby, Runs 6 & 7)	Axles		32	32	32	32	32			35	33
		Tons		215	220	215	215	215			200	190
0·0	Manchester	dep.	0	M. S. 0.00	M. S. 0.00	M. S. 0.00	M. S. 0.00	M. S. 0.00	0·0	0	M. S. 0.00	M. S. 0.00
7·9	Cheadle Heath	arr.	12	11.15	14.30 b	12.05	11.55	11.10	7·9	12	10.40	11.10
4·0	Hazel Grove	pass	—	8.20	8.40	8.15	8.30	8.00	11·9	—	15.10 k	16.05
11·8	Chinley	,,	18	20.25	21.20	20.55	21.15	20.20	19·7	29	27.50	26.55
13·8	Chapel-en-le-Frith	,,	—	23.50	24.55	24.35	24.45	23.35	21·7	—	30.50	30.15
17·5	Peak Forest	,,	27	30.55	31.55 c	31.15	31.45	30.30	25·4	38	37.00 c	7.55
22·1	Miller's Dale	,,	32	35.40	37.20	35.45	36.35 c	35.10	30·0	43	42.45	13.25
31·9	Rowsley¶	,,	42	45.35	47.55	44.55	47.15	44.55 g	9·8	11	10.55	11.35
36·3	Matlock	,,	—	50.15	53.00	49.25	52.05	50.55	14·2	—	15.40	16.25
43·1	Ambergate¶	,,	54	57.45	60.45	56.30	59.10	58.10	21·0	23	23.15	24.00
48·2	Duffield	,,	—	63.55	66.40	62.20	64.55	64.00	26·1	—	29.05	30.15
52·8	Derby North Junction¶	,,	66	68.40	71.25	67.00	69.45	68.40	30·7	—	33.40	34.55
—	Derby	arr.	—	*via* AVOIDING LINE					31·3	35	34.55	36.10
54·9	Spondon Junction	pass	—	72.00	74.55 d	70.10	74.05 f	72.20 d	2·1	—	4.25	4.10 l
61·5	Sheet Stores Junction	,,	79	78.40	81.50	77.05	81.20	79.10	8·7	13	11.25	12.10
64·9	Kegworth	,,	—	82.45	85.40	81.10	85.15	83.15	12·1	—	15.00	16.05
69·7	Loughborough	,,	—	87.45	90.35	85.40	89.55	88.00	16·9	22	19.55	21.00
77·5	Syston	,,	—	95.30	98.35	93.25	97.30	96.00	24·7	30	28.20	29.10
81·5	Humberstone Road	,,	—	99.15	102.25	97.05	101.10	100.35 h	28·7	—	6.25	6.25
82·2	Leicester	arr.	101	101.00 a	103.40	98.35	102.25	102.05	29·4	37	7.45	7.40
7·9	Net time (A) min.		12	11¼	12	12	12	11¼	30·0	43	39	40½
82·2	,, ,, (B) ,,		101	100½	102	98¼	100¾	99	31·3	35	35	36¼
—	,, ,, (C) ,,		—	—	—	—	—	—	29·4	37	33	32½
90·1	Total net time (min.)		113	111¾	114	110½	112¼	110¼	90·7	115	107	109½

A—Manchester–Cheadle Heath, Runs 1–5 and Manchester–Miller's Dale, Runs 6 and 7. B—Cheadle Heath–Leicester, Runs 1–5 and Miller's Dale–Derby, Runs 6 and 7. C—Derby–Leicester, Runs 6 and 7. ¶—Service slacks. ‖—Conditional stop. †—No. 753 and ‡ No. 752, in each case class 3, from Derby. *—18 axles (120 tons) from Miller's Dale. a—Sigs. outside Leicester. b—Sig. stop, Combrook Junction. c—Sigs., Blackwell Mills North Junction. d—Sigs., Chaddesden, slight. e—Sigs., Haddon, very severe. f—Sigs., Chaddesden, 5 m.p.h. g—Sigs., Darley Dale, moderate. h—Sigs., severe. k—Sigs., severe, New Mills S. Junction and Gowhole. l—Sigs., Sawley Junction and Sheet Stores Junction, moderate.

Thick horizontal line indicates stop.

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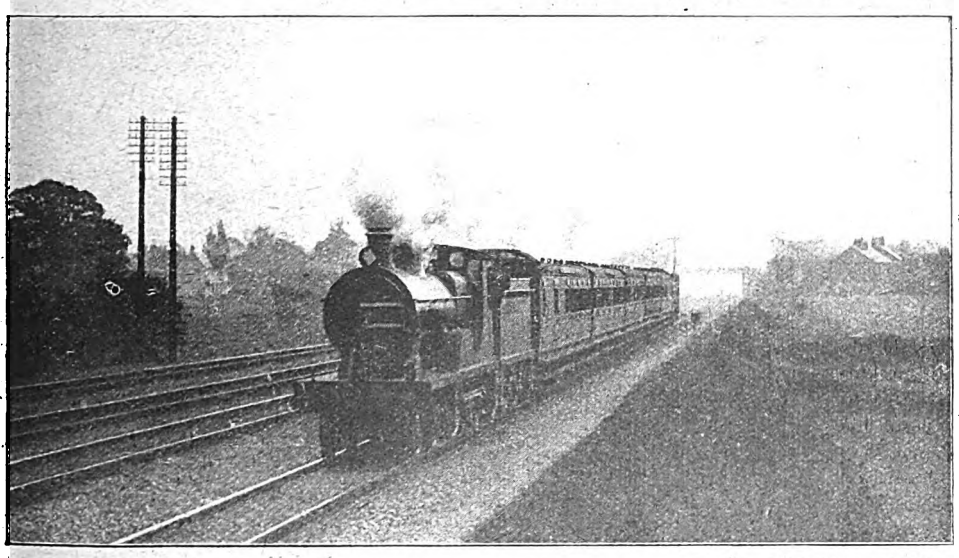
the Great Western Railway that is worthy of note, the standard Cardiff times, which were already fairly easy of accomplishment, being now increased to 3 hours, and the Birmingham times, on such trains as still remain, to 2½ hours. In the latter case, though, it seems curious that so fast a time as 27 min. for the 23½ miles from Birmingham to Leamington still remains in operation with 4 trains, curtailed even to 26 min. in the case of the 7.50 p.m. from Snow Hill. The 4.55 p.m. from Paddington also retains its time of 70 min. for the 63½ miles from London to Oxford. Among other good bookings which I omitted to mention in connection with the West of England services should be included



Photo] [*E. A. Gurney Smith.*

SOUTH EASTERN AND CHATHAM RAILWAY.
Up express passing Orpington. 4-4-0 engine No. 516.

that of 85 min. in each direction between Bristol and Exeter, 75½ miles, by the 1.15 p.m. down and the 3.12 p.m. up respectively; this is nominally an acceleration of 5 min. in the latter case, although the working time has always been 85 min. in recent years. It is also interesting to note that the best bookings between Hereford and Shrewsbury by the North to West route, all operated by Great Western engines, remain unchanged. I had some runs by these trains on the "agenda" for this month, but the space occupied by the Midland Manchester–Leicester journeys makes it necessary to postpone the Hereford–Shrewsbury runs till the April or May issue.

Concerning lines not already mentioned but little remains to be said, the decelerations being uniformly drastic and general. On the Caledonian line practically no noteworthy times remain, while much the same remark applies to the Glasgow and South Western Railway. The North British Railway has not perhaps been quite so heavy-handed in its changes, and one is pleased to see the retention of the best Edinburgh–Glasgow timings, such as 58 min. from Edinburgh (Haymarket) to Glasgow (which includes passing Lenzie, 39⅞ miles from the start, in 45 min.), and Glasgow to Edinburgh (Waverley) in 65 min., with two intermediate stops. In an early number, by the way, I hope to devote some attention to Scottish runs. The Irish lines have up to the present made practically no alteration in their train services, some of which—notably the accelerated services of the Great Northern Company—now occupy a high place in these islands as regards the merit of the locomotive work involved. But it is now imperative that we should turn to performance.

I have been intending for some considerable time to devote a little attention to the Derby–Manchester section of the Midland main line, which has, perhaps, suffered somewhat from neglect in these columns in the past. But that, unfortunately, arises out of the fact that I was unfortunate enough to lose a "log" book containing a particularly interesting collection of runs on the 10.0 a.m. from London to Manchester, and the 4.15 p.m. return express—both suspended

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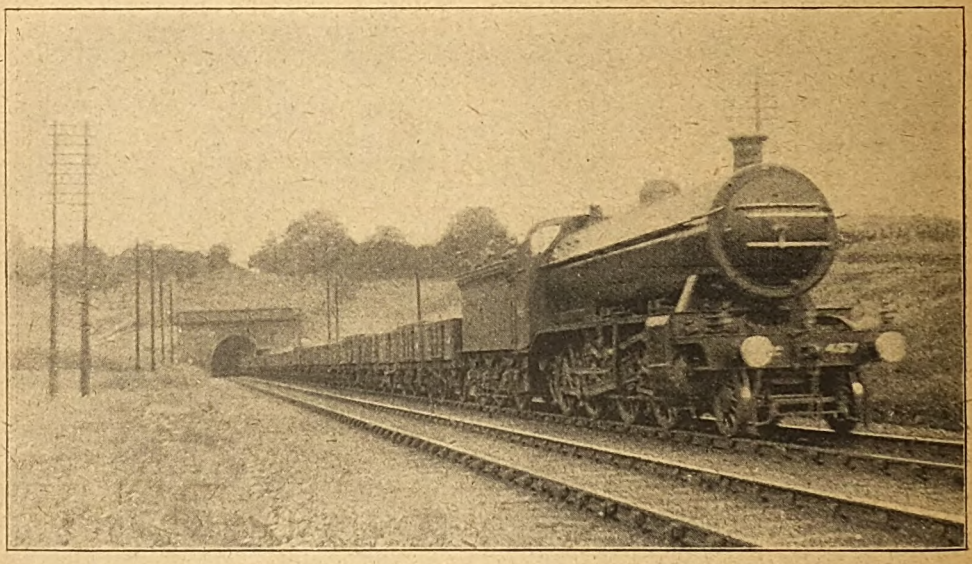
since the early days of the war. During last year, however, business in Cottonopolis enabled me to make a number of journeys over the "Peak" route, the results of which are tabulated herewith. Before dealing with the runs in detail, it may be well to review briefly the gradients and general characteristics of the route concerned. As the up journey only is dealt with, owing to considerations of space, the description shall commence from Manchester and work southwards.

The immediate start out of Manchester is a good one, a fall mostly at 1 in 100 commencing ¼-mile out of the Central station, and continuing for a mile, as far as Throstle Nest Junction, where the Cheshire Lines Committee main Liverpool line bears off on the right. From there, beyond 1½ miles ascending at 1 in 393–160–100 from Withington to Heaton Mersey, the line is comparatively level to Cheadle Heath, where the Peak Forest ascent proper may be said to commence. This climb, which continues practically unbroken for 17 miles, is one of the most difficult stretches of main line in Great Britain over which express bookings are in force. It begins at 1 in 100–140–110, with ½-mile beyond at 1 in 200 to Hazel Grove; from there it continues with ¾-mile at 1 in 100, and 2⅛ at 1 in 132, to the southern end of Disley Tunnel. Then there is a brief ⅝-mile of level, followed by ½-mile up at 1 in 100, and thenceforward the grade is continuously at 1 in 90–91 for 8½ miles, save for a mile at 1 in 95 from Bugsworth to Chinley.

From Peak Forest summit the line falls rather less steeply to Rowsley, and there are, moreover, several breaks in the continuity of the inclination. From the top, ¼-mile north of Peak Forest station, there are 3½ miles down at 1 in 90, followed by 1¼ miles at 1 in 111–101 to Miller's Dale. Then comes ⅜-mile up at 1 in 105, before the fall is resumed for 2 miles at 1 in 100, and another ¾ at 1 in 125 past Monsal Dale. Here the second "break" occurs, of ⅜-mile up at 1 in 107, after which there is another drop of 4 miles, mostly at 1 in 100–103. Abreast of Haddon Hall, beyond Bakewell, there is a further short rise of ¼-mile at 1 in 143, and the steepest part of the descent then concludes with a fall of 2½ miles to Rowsley Junction, 2 of which are at 1 in 102. There are no further grades of any moment, save 2¼ miles down at 1 in 177–229 from High Tor Tunnel, just beyond Matlock. The general tendency is a gradually falling one all the way to Trent, save for two slightly rising miles past Whatstandwell; beyond this the most notable stretches are 3 miles down at 1 in 379–406 from Rowsley Junction, and 5 down at 1 in 383–448 from Ambergate. From Trent to Leicester the line is nearly level, but on the whole slightly against the engine.



Photo] [*W. K. Smith.*

GREAT NORTHERN RAILWAY.

2–8–0 superheater engine on mineral train, near Hadley Wood.

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As regards speed, full advantage is never taken of the descents on either side of Peak Forest, and the rate is but rarely allowed to exceed 65 m.p.h., being generally kept at about the mile-a-minute figure. South-bound trains slack to about 40 m.p.h. over the curve at Rowsley, and very severely through Ambergate, while the restriction through Derby North Junction for trains taking the avoiding line is almost a walking pace. It is also customary in this direction to moderate the speed to about 45–50 m.p.h. between Sheet Stores and Trent Junctions at Trent.

The bookings are in some respects curiously arranged. For instance, the 27 min. allowed on the 12 noon *ex*-Manchester from starting at Cheadle Heath, actually on the grade, to Peak Forest, 17½ miles, is almost a "counsel of perfection" with a load of over 200 tons, unless the engine be thrashed. From there to Ambergate the allowance is a comparatively normal one for a cautious descent of the bank, the 12 min. from Rowsley to Ambergate—11·2 miles, beginning and ending with a slack—alone being a little tight. Against this we have the uncommonly liberal allowance, even granting the most scrupulously careful observance of Derby North Junction slack, of 13 min. thence to Sheet Stores Junction, a distance of only 8·7 miles. I am inclined to wonder whether this is in order to allow trains to pass through Derby station and round the loop to Spondon should the avoiding line not be clear from any cause. Whether this be so or not, drivers generally drop 3 min. or so from Cheadle Heath up to Peak Forest, and regain the bulk of the arrears between Nottingham Road and Spondon, as the table clearly shows. The 22 min. schedule from Sheet Stores Junction to Leicester, 20·7 miles, is tight, but is generally observed without difficulty. In the reverse direction the bookings approximate more to average performance.

Very little need be said concerning the runs themselves, in view of the uniformity of their details—an excellent feature of locomotive working that is so characteristic of the Midland Railway. The first six on the up journey were made on the noon express up, the addition of the Liverpool portion (two 8-wheelers) at Cheadle Heath bringing the load up to its customary standard of five 8-wheeled vestibuled coaches and two 12-wheeled dining cars, or 215–220 tons with passengers and luggage. To Cheadle Heath the load was generally 5 cars, except on Saturdays, when an extra vehicle was always attached, and some very smart runs were made over this stretch, driver Hailstone, on compound No. 1013, carrying off the honours on runs 1 and 5 with times of 11 min. 15 sec. and 11 min. 10 sec. respectively.

There is quite an extraordinary likeness between the times from Cheadle Heath up to Peak Forest. It is on a steeply inclined stretch such as this that one usually finds the greatest variation in performance, but on these journeys the times from Chinley to the summit do not vary by more than 25 sec., while the starting times to Chinley only show a maximum variation of 55 sec. The intermediate speeds recorded were these. On the short 1 in 200 length past Hazel Grove the highest speed timed was 42½ m.p.h. (run 5), and the lowest 37½ (run 3), while at the further end of Disley Tunnel the corresponding figures were 38½ (run 2) and 33½ (run 5) m.p.h. respectively. The subsequent tiny level strip brought the speed up to 50 m.p.h. on run 1, but only to 45½ on run 5, while at Chinley the maximum was 36½ m.p.h. on run 5, and the minimum 34½ on runs 2, 3 and 4. In the latter connection it is worthy of note, as showing the uniformity of the running, that on runs 2, 3 and 4 also the speed beyond Disley Tunnel was 46 m.p.h., and on 3 and 4 it was exactly 36 at Hazel Grove. On the final ascent the rate remained constant at 32 m.p.h. through Dove Holes Tunnel in run 1, increased from 31½ to 32 in run 2, but fell in the other three cases, from 34½ to 31 m.p.h. in run 3, 32½ to 29 in run 4, and 34 to 30½ in run 5.

As previously explained, little in the way of speed is attempted downhill, and in point of fact we did not exceed 64 m.p.h. between Peak Forest and Rowsley on any run but No. 3, where a speed of 69 was momentarily reached before Miller's Dale and near Monsal Dale also. The latter was a comparatively quick descent, over 1¼ min. being regained on the stretch in question. Run No. 2 was badly hampered by heavy snow, in which the upper parts of the line were at times almost covered, the period when this run was "logged" being that of the memorable blizzard in the early spring of last year, and this was therefore the slowest run down of any. Brakes were applied at several points on most of the runs, and in each case the Rowsley slack was carefully observed. No 1012 on Run No. 3 also carries off the honours between Rowsley and Derby, mainly in

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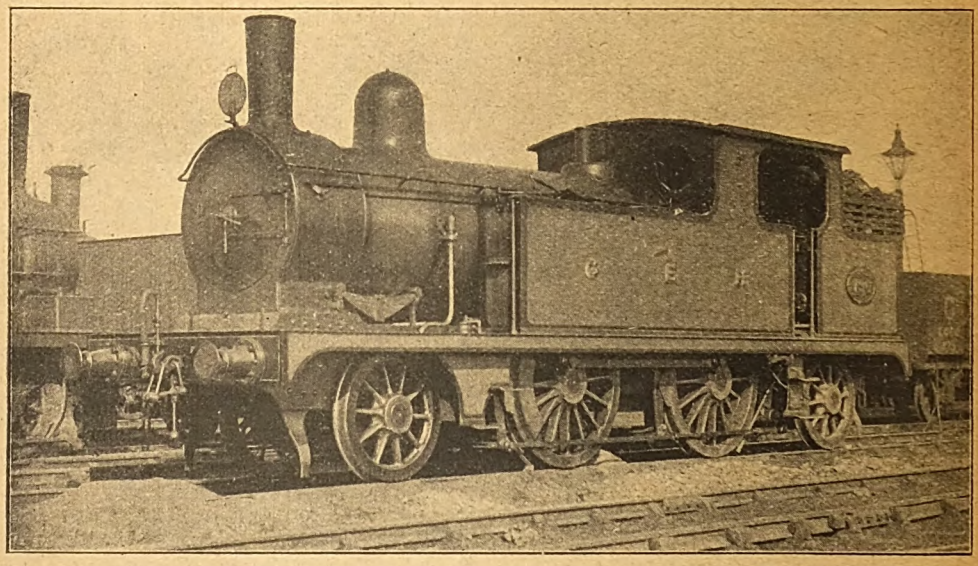
virtue of the quick recoveries from Rowsley and Ambergate slacks, but I have no record of the maximum speeds attained. Once again the work beyond Ambergate was extraordinarily uniform in character, there being no greater variation than 25 sec. in the times from there to Derby North Junction. A top speed of 67 m.p.h. was attained on the level near Duffield on runs 2 and 5, while 69 m.p.h. was reached on run 4 near Whatstandwell.

Even when delayed by signals, no driver failed to economise on schedule between Derby North Junction and Sheet Stores Junction, that economy reaching a maximum of 3 min. on run 1, and all but 3 min. on run 3. Beyond Trent the best running was made on runs 3 and 4, the sustained speed in the former case being 64 m.p.h. at Loughborough and beyond Syston, while in the latter case the figures were 65 and 66 m.p.h. respectively, the gaining of a full minute on the last booked length being particularly good, as the grade is mostly against the engine. Beverley was the driver. In view of the entire absence of delays, No. 3 run affords considerably the best time, involving as it did a clear gain of nearly 2½ min. on schedule. From Peak Forest to Leicester 6 min. 40 sec. were gained, while the 64 miles from Peak Forest to Humberstone Road only occupied 65 min. 50 sec., inclusive of slacks at Rowsley, Ambergate (severe) and Derby North Junction (very severe), as also of easy running between Sheet Stores and Trent Junctions. Sykes was the driver on this occasion. Hailstone's run in column 5 was also good, especially in its uphill work, which, after allowance for delays, brings the net time ¼ min. within that of run No. 3. Taking into consideration the particularly heavy character of the route traversed, it would be hard to find a more commendably uniform series of runs than those tabulated in columns 1 to 5.

In the last two columns—6 and 7—are a couple of runs on that particularly tightly-timed express—the 7.30 a.m. from Manchester to London—which until the decelerations contrived to reach St. Pancras in 4 hrs. 2 min., despite no less than five regular and one conditional stops, the last-mentioned of which—at Syston, for the Eastern Counties—was nearly always made. For the initial 30 miles to Miller's Dale 43 min. were allowed, followed by 35 min. for the downhill 31·3 miles to Derby, including Rowsley and Ambergate slacks. Then for the 29·4 miles



Photo] [*J. Macartney Robbins.*

GREAT EASTERN RAILWAY.

2–4–2 tank engine No. 796, at Cambridge.

NOTE.—This is one of the original 2–4–2 tank engines built by Mr. James Holden and immediately following the Worsdell 650–679 series of 1884–5. The latter had Joy valve gear, whereas the Holden class had ordinary link motion. As first built the dome was placed about midway along the boiler barrel.

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from Derby to Leicester, including the conditional Syston stop, 37 min. was the schedule. But perhaps the hardest times were south of Leicester, only 31 min. being allowed for the very severely graded 27·1 miles to Kettering, 24 min. thence over Sharnbrook summit to Bedford, 22·1 miles, and 55 min. for the 49·8 miles from Bedford to St. Pancras, in each case start-to-stop. This makes a total running time of 3¾ hours exactly from Manchester to London, not allowing for the conditional stop, and there is no doubt that this was one of the hardest trains to work that the Midland Company has ever run.

From Manchester the load was always small, and on run 6 driver Beverley, with compound No. 1014, made light work of the booking to Derby, the initial time to Cheadle Heath being exceptionally fast, with a maximum speed of 61 m.p.h. at Didsbury. On the 1 in 132 beyond Hazel Grove we averaged 40 m.p.h., but were then badly delayed by signals from New Mills to Bugsworth, sustaining two bad checks. Even then, accelerating on the 1 in 90 to 42 m.p.h., we passed Chinley before time, afterwards easing to 35 m.p.h. at the summit. Undelayed we should probably have gained 4 min. to Miller's Dale. Thence to Derby, with a slightly lightened load, Beverley took matters easily, not exceeding 65 m.p.h. to Rowsley (save for a brief stretch at 67 near Monsal Dale), although we touched 67 near Belper. At Derby No. 1014 was replaced by No. 753—a Johnson 4–4–0 of class 3—and the load became more substantial. Some smart running was made thence to Syston, where the conditional stop was called, this 24·7 miles' journey only occupying 28 min. 20 sec., with speeds of 64 m.p.h. at Borrowash and 61 at Loughborough, while the final 4·7 miles into Leicester were covered in 7¾ min. start-to-stop. Thus the 29·4 miles from Derby to Leicester were covered in just under 37 min., even including the stop, but the net time would not exceed 33 min.

No. 706, a Johnson 4–4–0 of class 3, did not do so well as the compound from Manchester on run 7. Nevertheless, we passed Chinley in more than 2 min. under schedule, and, despite a special stop at Chapel-en-le-Frith, only exceeded booked time to Miller's Dale by 1 min., or by 40 sec., actual running time. At Hazel Grove we were doing 46½ m.p.h., while at Chinley we were sustaining 41 m.p.h. After starting from Chapel-en-le-Frith, an acceleration up the continuous 1 in 90 ascent was registered to 34½ m.p.h. From Miller's Dale down to Derby, however, we went very sluggishly and dropped nearly 1¼ min. At Derby No. 752 of the same type took charge, and got away to Spondon more rapidly than No. 753 on the run preceding, but a couple of slight signal checks, at Sawley and Sheet Stores Junction, delayed us thence to Kegworth. But a smart stop at Syston, and another one at Leicester, resulted in our only having exceeded the Derby–Leicester allowance, including a stop of 35 sec., by less than ½ min. Our net time from Leicester to Syston was 27¾ min., start-to-stop, and to Leicester (allowing for the stop), about 32¼ or 32½ min.

Considerations of space will not permit me to describe my journeys in the return direction from Leicester to Manchester, which must be held over for awhile, and in conclusion I cannot, therefore, do better than to continue the description of the two last mentioned runs south of Leicester—considerably the hardest-timed section of the journey. On the first occasion (continuing run 6), the engine from Leicester was No. 1042, compound 4–4–0, driver Phelan, and the load was one of 32 axles, 186 tons empty and 200 tons full. On the first 27·1 miles' length to Kettering we set off in magnificent style, passing Kibworth, 10·2 miles out—almost entirely uphill and concluding with 1½ miles at 1 in 199 and a further 1½ at 1 in 156–161—in 13 min. 25 sec., and Market Harborough, 16·2 miles, in 18 min. 25 sec. The top speed down Kibworth bank was 77½ m.p.h., and we "eased" carefully for Harborough station. Nevertheless, the lowest speed up the 4 miles at 1 in 132–133 to Desborough was 48½ m.p.h., the 4·8 miles between Harborough and Desborough taking 5 min. 35 sec., and with a further maximum of 77½ beyond Glendon we stopped at Kettering in the splendid time of 29¾ min. from Leicester—1¼ min. under schedule.

Getting away again very smartly, we were doing 64 m.p.h. at Finedon and 69 at Wellingborough, passing the latter place, 6·9 miles from Kettering, in 8 min. 20 sec., and No. 1042 then breasted the 4¼ miles' ascent of Irchester bank—1½ at 1 in 163–192 and the last 2¾ at 1 in 120—with a minimum rate of 48½ m.p.h. This resulted in the astonishing time of 13¾ min. for the 12·2 miles from Kettering start to Sharnbrook summit. After this a very easy descent was made to Bedford, for some distance with steam off, and with no higher speed than 69 m.p.h., but for all that the 22·1 miles from Kettering to Bedford

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were completed in 23¾ min., start-to-stop—¼ min. under schedule. At Bedford the load was increased by a further 8-wheeler, making a total of 36 axles, or 225 tons, and a comparatively leisurely ascent was made to Luton—for the Midland—speed falling to 47½ m.p.h. at Ampthill and 49½ at Toddington, with an intervening maximum of 58½ at Flitwick. So it took us 11 min. 50 sec. to pass Ampthill, 8 miles, and 24 min. 40 sec. to Luton, 19·5 miles, although the next 5·6 miles to Harpenden were run in 5¼ min., with a maximum rate of 69 m.p.h. At St. Albans, however, we were very badly checked by signal, so that the 17·7 miles from Harpenden to Hendon took 18¼ min. instead of a more probable 16 or less, and despite a smart finish from Hendon into St. Pancras (7 miles) in 8 min. 25 sec., the total journey of 49·8 miles from Bedford had taken us 56 min. 35 sec. But the net time was not more than 54¼ or 54½ min. at most, making an aggregate net running time from Leicester (including starting and stopping twice), of not more than 107 min., instead of 110 min.

On the second occasion (continuing No. 7 run), No. 1033, 4–4–0 compound, was the engine from Leicester, driven by Cook, and the load again 32 axles, or 200 tons, but the work was not quite so good on the whole. It took us 13 min. 50 sec. to get through Kibworth and 19¼ min. to Market Harborough, with a maximum of 74 m.p.h. A signal check was experienced before Harborough, so that with a minimum rate of 44 m.p.h. on Desborough bank, Harborough–Desborough took 6 min. 20 sec., and Kettering was reached in 31¾ min. from Leicester, 30¾ min. net. Re-starting, we passed Wellingborough in 8 min. 40 sec., at 64 m.p.h., and Sharnbrook summit in 14¼ min., at 48 m.p.h., reaching Bedford, after a sustained maximum of 75 m.p.h. on Sharnbrook bank, in 23 min. 55 sec. from Kettering. The feature of the run, however, was a magnificent start from Bedford, the load in this case being unchanged. A rate of 50½ m.p.h. was maintained to Ampthill, and, after a maximum of exactly 60 at Flitwick, of 52½ to Toddington (remarkable figures, these, after 8 miles up in the former case, concluding with 4 at 1 in 200, and 6¼ in the latter almost unbroken at 1 in 202); thus we were through Ampthill in 11 min., and Luton in 23¼ min., running now at 71½ m.p.h. The Luton–Harpenden stretch occupied 5 min. 5 sec., but then came again the unfortunate check at St. Albans, the time from Harpenden to Hendon in this case being 18½ min. Again we finished smartly from Hendon into St. Pancras, in 8 min. 50 sec., although checked by signal outside Kentish Town, our total time from Bedford being this time 55 min. 40 sec. But I reckon that the net time did not exceed 52½ or 52¾ min., making, at very most, a net actual running time of 107½ min. from Leicester.

Some interesting figures may be deduced from these times. Adding together the net running times from Manchester to London, we get on the first run a total of 214 min., and on the second one of 217 min., for a journey of all but 190 miles, inclusive of time lost in stopping at and starting from Miller's Dale, Derby, Leicester, Kettering and Bedford, but not at Syston. The total running allowance, which presumably allows for Syston stop, is one of 225 min. As nearly as I can estimate, the net time from Manchester to Leicester on run 6, assuming no stops had been made, would have been 102¼ min., while from Leicester to London the figure would be almost exactly "even time," *i.e.*, 99 min. Thus, allowing a stop of fully 5 min. at Leicester, we get an overall net time from Manchester to London of well under 3½ hours. I was particularly glad to make these two runs, as they show the Midland at its very best, on a very difficult schedule of tightly-timed "snippet" runs, and on both occasions, despite all delays, our arrival was within one minute of schedule time.

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Locomotive and Train Working in the latter part of the 19th Century.

NORTH EASTERN RAILWAY. [No. V.]

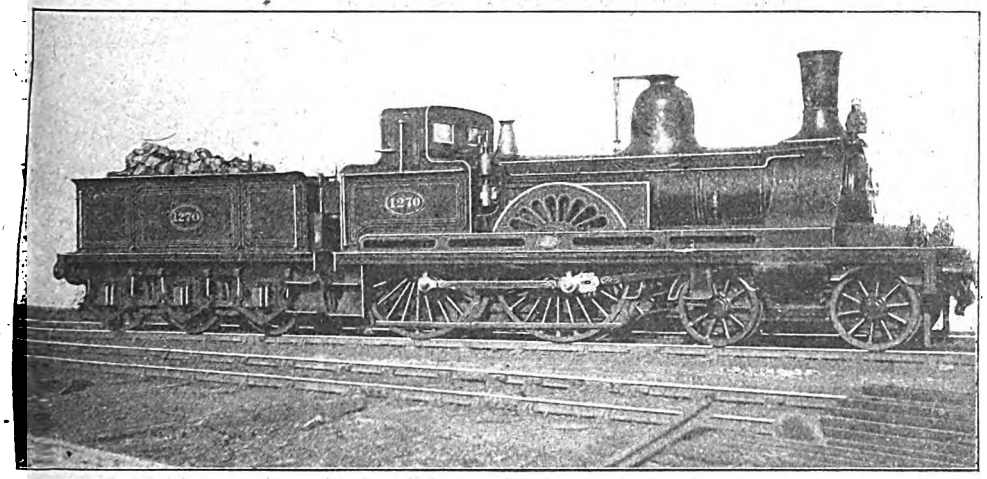
By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 123, *February* RAILWAY MAGAZINE.)

ANOTHER type of Stockton and Darlington engine, which worked over the same roads as the previous engines, consisted of a class of 6 ft. coupled 2–4–0 engines with inside cylinders 17 in. by 26 in. and inside frames to all wheels. The first of these, No. 1071, was somewhat different from the later six engines and had a 24 in. stroke. It has been referred to as a "rebuild" of the old Stockton and Darlington No. 71 named *Hackworth*, constructed by Messrs. Kitching in 1851. This, however, was a double framed engine with 15 in. by 20 in. cylinders, and No. 1071 bore not the slightest resemblance to it. The other six, built after Mr. Bouch's Darlington pattern in 1875–6, were Nos. 1035, 1050, 1062, 1066, 1068 and 1098. No. 1068 is shown on page 192 in its original condition, but the splashers were modified at a later date to a style similar to those of No. 40 (page 193).

Although Mr. Fletcher had taken nominal charge of locomotive construction at Darlington, the engines afterwards turned out all bore marks of Mr. Bouch's design and differed entirely from anything built by Mr. Fletcher at Gateshead. Four express engines of 1877 date, Nos. 11, 1100, 1114 and 1166, were not unlike the preceding 1035 class, in that they had the same 17 in. by 26 in. cylinders and similar motion, but the diameter of the coupled wheels was increased to 6 ft. 6 in. Like the others, they were all rebuilt by Mr. Worsdell, who, in the case of engines 11 and 1166, added outside bearings for the leading wheels. These engines also were generally to be seen on the east to west main line of the Stockton and Darlington section.

The last express engines built at Darlington during Mr. Fletcher's time came out in 1882, a very short time before that gentleman resigned. These were Nos. 40, 58, 1099 and



MR. BOUCH'S 4–4–0 CLASS (NOS. 1265–1270, "GINX'S BABIES").
Built at Darlington, 1874, for the Stockton and Darlington section. Coupled wheels, 7 ft. diam. Cylinders, 17 in. by 30 in.
[This class was fully dealt with last month, and readers are referred to that instalment for particulars.]

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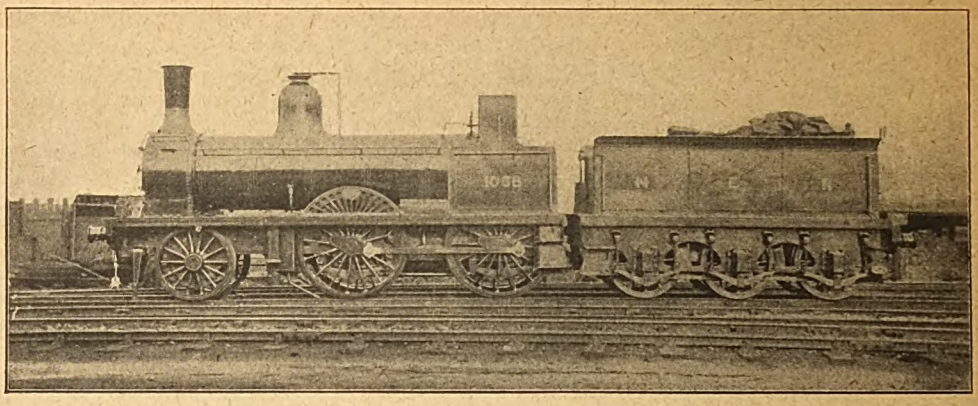
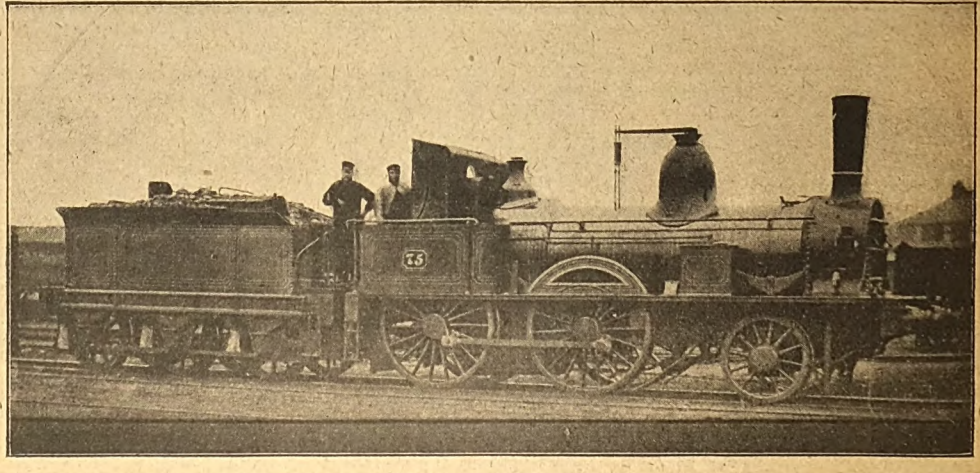


MR. BOUCH'S 2–4–0 CLASS, AS ORIGINALLY BUILT AT DARLINGTON, 1875–6.
Coupled wheels, 6 ft. diam. Cylinders, 17 in. by 26 in.

1101, and had considerably more of the Fletcher design about them than any of their predecessors. The cylinders were 17 in. by 24 in. and the coupled wheels were 6 ft. 6 in. in diameter. The framing and motion were very similar to those of the Gateshead engines. No. 40 ran for some time on the Saltburn and York fast trains, and the others took up the usual "Stockton and Darlington" work. They were all rebuilt by Mr. Worsdell, and 1099 then had the addition of a special valve gear designed by Mr. Younghusband, of Darlington. In 1894 1101 was removed to York and worked for a long time between York and Ilkley *viâ* Harrogate.

These twenty-six engines practically constituted the stud of tender passenger engines working over the central division lines. There were a few extra engines imported from Gateshead, but almost all the older passenger locomotives of the Stockton and Darlington had disappeared in 1877. All the Darlington built engines in Mr. Fletcher's day went by the name of "Quakers," an appellation which was generally applied to the Stockton and Darlington railway as a whole.

The northern division, which was centred at Newcastle and Gateshead, will not require much detailed mention, principally because the locomotive types were largely repetitions of those already mentioned in the southern division. Moreover, the main line services have already been discussed in connection with the work of the Fletcher 7 ft. coupled engines. There was, however, this difference between the two divisions, that whereas the



2–4–0 ENGINE, NO. 75, THE ONLY ONE OF ITS CLASS.
Coupled wheels, 5 ft. 6 in. diam. Cylinders, 15 in. by 22 in.

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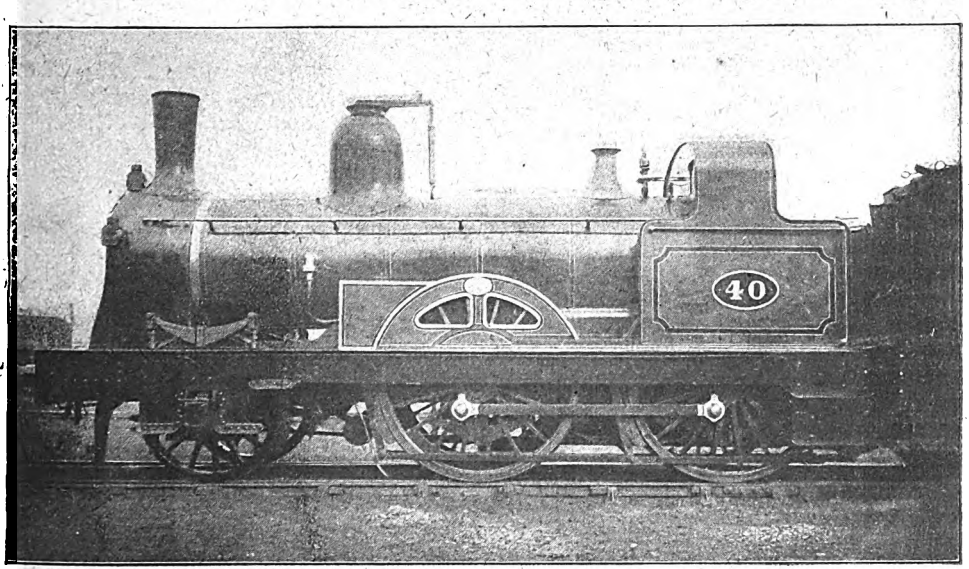
southern locomotive types had characteristics of York, Leeds and Gateshead itself, those in the north were confined almost entirely to Gateshead and private builders' types. But there were enough of these in all conscience to satisfy the most ardent locomotive archæologist.

The branches round Newcastle, etc., were principally worked by Fletcher's 0–4–4 bogie back tanks already considered. There were also a few of the small 2–4–0 engines of the 675 class. One curious engine very similar to the latter, which worked one of the Northumberland branches, was No. 75, built in 1863. It was the forerunner of the 675 class and had the same sized wheels, 5 ft. 6 in., and cylinders 15 in. by 22 in., and was the only engine of its class.

The most important branch in the northern division was the Newcastle and Carlisle railway. Between 1878 and 1882 nearly all the trains over this road were worked by the small 5 ft. 6 in. coupled engines—675 class—which have already been mentioned when dealing with the Hull district. Nos. 64, 465 (illustrated on page 31 No. 235) and 803 were stationed at Carlisle, and Nos. 68, 177 and 355 ran from the Newcastle end. Others, such as Nos. 176, 483 and 810, were seen occasionally on the road but these had been transferred to the Hull district by 1880. Carlisle also had No. 185, a small double framed rebuilt Stephenson, but this also migrated to Hull about 1879. An old Newcastle and Carlisle goods engine, No. 488, worked local passenger trains between Carlisle and Brampton. The only large engine which then ran over this road was the Fletcher 7 ft. coupled No. 912, one of the earliest to be fitted with the Westinghouse brake, for the others of the class, having Smith's vacuum, could not be used with the trains then being supplied with the Westinghouse. By 1882 the trains were becoming too heavy for the small 675 class, and some of the Newcastle Hawthorn's 6 ft. 6 in. coupled, such as Nos. 547, 553, etc., put in an appearance. Finally in 1884 nearly all the old Fletcher passenger engines were swept off this road, and replaced by McDonnell's bogie engines 1492 class, which almost monopolised the Newcastle and Carlisle passenger work for about 15 years.



Photo] [*Locomotive Publishing Co., Ltd.*

NO. 40, ONE OF FOUR ENGINES BUILT AT DARLINGTON, 1882, TO MR. FLETCHER'S DESIGNS.
Coupled wheels, 6 ft. 6 in. diam. Cylinders, 17 in. by 24 in.

The goods engines were a ragged and variegated assortment, but possibly were not so very different from those at most other North Eastern stations, and certainly they could not improve upon the samples at Hull, York or Leeds. Most of them had double frames, and included amongst the Carlisle collection was No. 2, with a bell-mouthed chimney and no cab. This also "sported" an old four-wheeled tender. No. 13 was very similar to No. 6 referred to later on, and No. 440, a Beyer Peacock, had a brass dome and small flat brass manhole cover.

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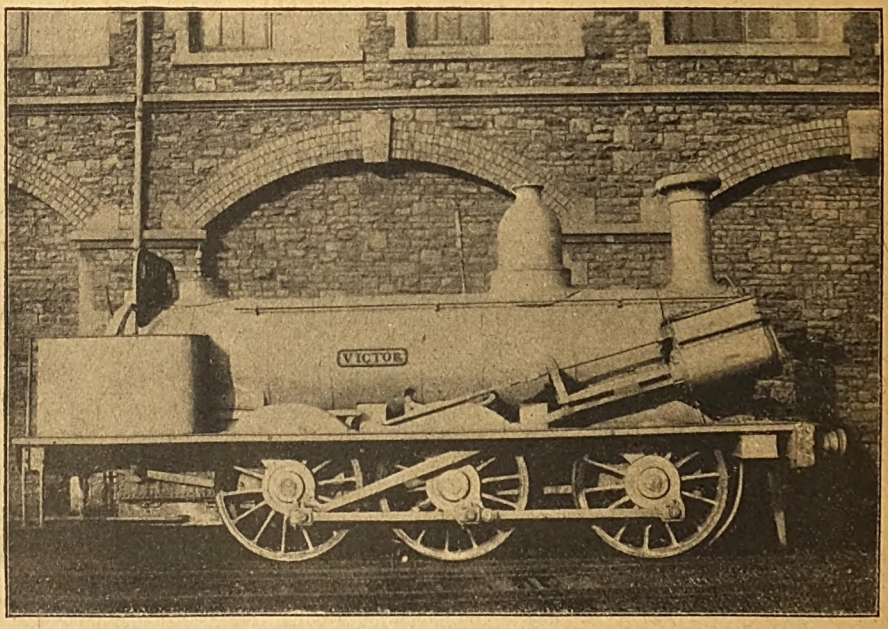
A dozen others, built by Kitson, Hudswell and Clarke, Stephenson, Hawthorn, etc., etc., completed the panorama. But for sustained interest there is no locomotive scenery nowadays that can compare with the rugged grandeur of the Fletcher era. The modern locomotive is much too prosaic.

In this connection a few words may be added on the subject of a quaint collection of locomotives which became North Eastern property about 1865, when the Port Clarence and West Hartlepool lines were taken over. There were some 55 to 60 of them, and never was there seen such a cranky lot. They had cylinders in all positions, vertical, horizontal, and inclined, and they were placed everywhere where cylinders, as generally understood in locomotive practice, should not be placed. The only spot free from them appeared to be the chimney tops, and had not considerations of loading gauge requirements interfered, they might have got up there too! These railways were somewhat antediluvian in their locomotive ideas, and apparently had started out about 1840 with the ancient Killingworth type of George Stephenson's earliest locomotives, and stuck more or less faithfully to the design, with assorted modifications of their own. The engines were too much even for the locomotive department of the North Eastern in spite of the "rugged grandeur" of the latter, and they were simply allowed to wear themselves out, and then exterminated in the 'seventies. I much regret that I have no photographs of any of these worthies on the North Eastern, but there was one of them of the very latest and most modern design that found its way to Llanelly, whence it subsequently came into possession of the Great Western Railway. It is a far cry from Stockton and Hartlepool to Swindon, but when the locomotive authorities of the latter place got hold of it, they placed it in a siding close to the works and showed it to anyone sufficiently interested in such matters.



OLD 0-6-0 ENGINE, *Victor*, BUILT BY FOSSICK & HACKWORTH (STOCKTON, 1864), BELONGING TO THE LLANELLY RAILWAY, SOUTH WALES.
This engine was preserved at Swindon for many years, and represents a type similar to some used on the West Hartlepool Railway.

The engine in question, the *Victor*, was built by Messrs. Fossick and Hackworth, of Stockton, in 1864. I believe it was intended for the Hartlepool Railways, but as the latter were then passing into the hands of the North Eastern, the *Victor* migrated to South Wales. An illustration of it is shown on this page. It was kept at Swindon until some time in the 'nineties, and I derived much pleasure in showing it to various engineers who visited the Great Western works. Of these the most profound interest in it was taken by two

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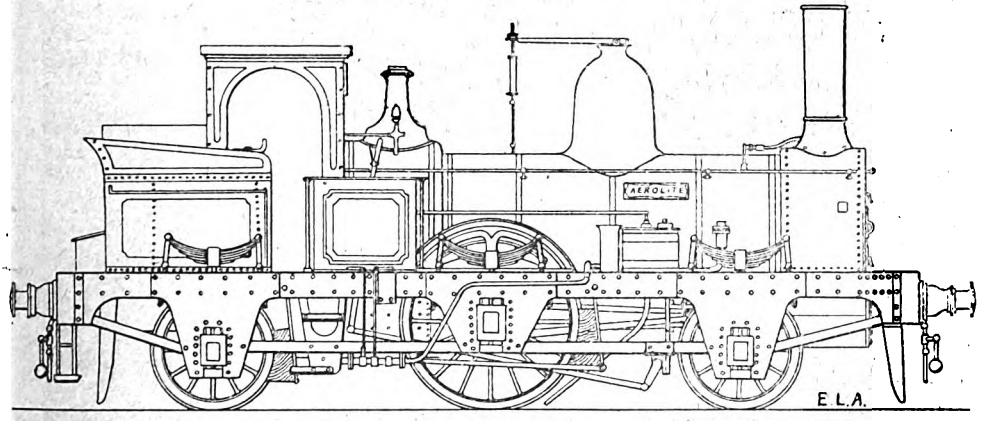
Chinamen on a visit to this country, who spent ten minutes at least in investigating its beauties, and came to the conclusion that it was probably contemporaneous with the Ming dynasty.

A few of the double framed 2–4–0 engines of the 25 and 29 classes were at work in the Gateshead district, but most of them had been gradually transferred to York, Leeds, Hull and Scarboro'. There remained, however, Nos. 38, 139 and 682, with 6 ft. wheels, and two others, Nos. 21 and 680, of the same class but with wheels only 5 ft. 6 in. diameter, were on Northumberland branches. Three other engines, Nos. 157, 312 and 459, remained in the north until 1881, when they were, as previously mentioned, despatched to the south. One other engine, No. 24, with 6 ft. wheels, appears to have drifted into the Darlington district, and was rebuilt with a Darlington boiler to make another variant of the many guises in which these engines appeared. Eventually, however, this engine was transferred to Selby. The remaining engine of the 25 class—No. 369, with 6 ft. 6 in. wheels—was stationed at West Hartlepool as a spare engine.

There were two small tank engines with single driving wheels kept at Gateshead, something after the pattern of No. 252 at York, but rather larger. One of these, No. 150, with 5 ft. 6 in. wheels, was used by the engineer of the northern division for his special coach. I never saw this engine and I am therefore unable to give further particulars.

But in addition there was also the celebrated *Aerolite*, used by Mr. Fletcher himself for special journeys. No engine has gone hrough more vicissitudes of re-design, for there have been four *Aerolites*, all different. The original *Aerolite* was a single driver well tank engine built by Messrs. Kitson, Thompson and Hewitson, of Leeds, and exhibited at the London Exhibition of 1851. It had 6 ft. driving wheels and 11 in. *outside* cylinders, and was eventually purchased by the Leeds Northern Railway. When it came into the possession of the North Eastern, it was numbered 369 and retained this number until 1869, in which year it appears to have been condemned. A new *Aerolite*, however, arose from the débris, of quite a different design, and this lasted from 1869 until about 1886. In Mr. Fletcher's time it carried a name only and no number, but when Mr. McDonnell succeeded him he immediately numbered it 1478, but after bearing this number for about eighteen months it was renumbered 66 in 1885. The cylinders, 13 in. by 20 in. were inside, the single driving wheels were 5 ft. 6 in. diameter, and the tanks were underneath and at the back. In 1886 Mr. T. W. Worsdell renewed it—rebuilt is hardly correct—with an entirely new outside frame and side tanks, but it remained a 2–2–2 tank engine. At a still later date it underwent another complete transformation, which included another new outside frame and a trailing bogie. It may now be fairly described as one of the prettiest little engines in the country. But having passed through four completely different stages, it can hardly be said that there is anything of the original engine remaining.



Aerolite, AS ORIGINALLY BUILT.

A few notes as to Mr. Fletcher's goods engines may be added at this point. Many as were the classes and shapes of the passenger engines, these were as nothing compared with the goods engines, and I do not therefore

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intend to do more than mention a few of the more numerous types.

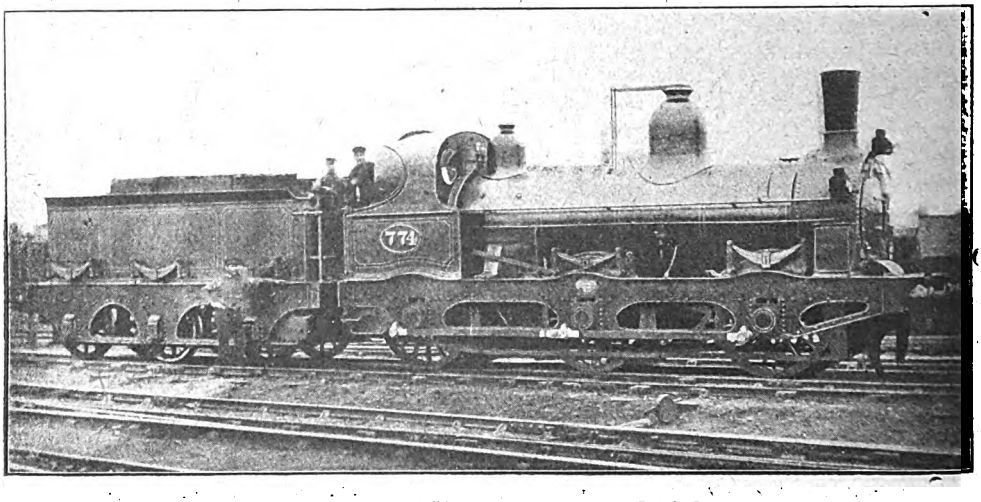
There were many old goods engines somewhat similar to engine No. 6, some with all the wheels in front of the firebox. Most of these, some of which were of Gateshead build, and others from the works of various makers, had 5 ft. wheels and 16 in. by 24-in. cylinders.

The style of mineral engine used by the North Eastern, of which there existed many examples, had wheels varying from 4 ft. 6 in. to 4 ft. 8 in. with 15 in. by 24 in. cylinders. The old No. 1 of Mr. Fletcher's days, stationed at Tyne Dock, was of this type. The trailing wheels were in front of the firebox, so that the engines went by the name of "short-coupled" amongst the North Eastern men.

No. 774 was one of a more or less homogeneous class of 70 engines—Nos. 706 to 775, having 5 ft. wheels and 17 in. by 24 in. cylinders. The first fifty of these were built by Messrs. Stephenson and Co. in 1870–1, and Nos. 756 to 775 by Messrs. Hawthorn in 1872–3. They had sandwich frames, *i.e.*, a thick plank was inserted between two iron plates of the outside frame. These engines were very great favourites with the men, and certainly did a large amount of excellent work. They were all rebuilt but have now disappeared from service.

Finally there is No. 174, the first of Mr. Fletcher's standard Gateshead built goods engines, one of the very few classes that merit the term "standard." These were built between 1875 and 1883 and there were a fair number of them, all with 5 ft. wheels and 17 in. by 24 in. cylinders. Somewhat similar engines but differing from them and from each other in most details in outward appearance were built by Stephenson, Hawthorn, Neilson, Dübs and Sharp Stewart. The Hawthorn engines—824 class—were always known as the "Belgians," for it was stated that they were erected by imported Belgian mechanics in 1873–4 during a strike at Messrs. Hawthorn's works.

All the various classes just mentioned, together with the very different Darlington built goods engines, have more recently been considered together as the 398 class, but this is an elastic description which includes a multitude of engines. The standard pressure for nearly all Mr. Fletcher's engines was 140 lbs., though some older ones worked at a reduced pressure.



GOODS ENGINE, 706–775 CLASS, BUILT 1870–3.
Coupled wheels, 5 ft. diam. | Cylinders, 17 in. by 24 in.

One other class of goods engine, which I regret that I am unable to illustrate, deserves special mention. This—the 81 class—consisted of the eleven engines Nos. 81, 116, 236, 593, 617, 626, 1076, 1082, 1121, 1154 and 1164, all built at Darlington in 1880 to 1882. They were express goods engines with 17 in. by 26 in. cylinders and six-coupled wheels of the large diameter of 5 ft. 8 in. They were generally, however, used for excursion trains, and for this purpose all of them were fitted with the Westinghouse brake. Three or four of them were stationed at York.

(To be continued.)

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British Railway Service and the War. [XI.]

IN view of the widespread agitation against the increase of railway fares, involving undoubted grievances in many cases, Mr. Lloyd George, in his great speech at Carnarvon on Saturday, February 3rd, explained the reasons for the action taken. A portion of his remarks may be quoted: "When I was Secretary of State for War one of my first duties was to appoint a great railway manager to take over the question of railway transport. The Commander-in-Chief in France not merely welcomed his appointment, but instantly appointed him as chief railway representative behind the lines. He is one of the ablest railway men in the world, and the railway system there has been taken in hand. But you needed locomotives, you needed wagons, you needed drivers, you needed steel rails, and even if these had been times of peace you could not have had them without taking no end of time in manufacturing for a great demand of that kind. The President of the Board of Trade had to take the matter in hand. He thought it was common knowledge that there was infinitely more travelling on the part of the general public in this country than in any fighting country in the world—non-essential travelling—and he advised these restrictions in order to cut down unnecessary travelling."

"What has been the result? He has already saved hundreds of locomotives—I could tell you how many—for the Army in France, and their drivers are volunteering to go there. The Union of Railway Servants has been extremely helpful to us in engaging them. He saved tens of thousands of wagons; he saved scores of thousands of tons of steel rails, that we could not possibly get manufactured for at least a year, and not even then except at the expense of steel which we required for building against submarines."

The Minister of Munitions notified under date of February 2nd that "in exercise of the powers conferred upon him by the Defence of the Realm (Consolidation) Act, 1914, the Defence of the Realm (Amendment) No. 2 Act, 1915, the Defence of the Realm (Consolidation) Regulations, 1914, the Munitions of War Acts, 1915 and 1916, and all other powers thereunto enabling him, hereby orders that all persons (other than railway companies) owning and having in their possession or under their control any steam or petrol locomotive engine or engines in Great Britain shall within ten days from the date hereof send in to the Deputy Director General of Railway Material Licences, Ministry of Munitions, Whitehall Place, London, S.W., returns containing the following particulars with regard to such engine or engines: (a) Type of locomotive; (b) steam or petrol driven; (c) name or number of locomotive; (d) owner's name and address; (e) maker of locomotive; (f) date on which locomotive was built; (g) gauge of railway; (h) maximum height —ft. —in., and width —ft. —in. of locomotive; (i) work (if any) on which locomotive employed; (j) weight and general description; and to make such further returns concerning any such engine or engines as may hereafter be required by the Deputy Director General of Railway Material Licences."

Mr. W. A. Marsden, Assistant Goods Manager, Lancashire and Yorkshire Railway, has been appointed by the War Office to the Committee controlling the Australian and New Zealand Wool Clips. In July, 1916, the services of Mr. Marsden were placed at the disposal of the War Office, and he assisted in the Transport and Storage in connection with the Government purchase of the English Wool Clip. In his new appointment he will assist in one of the largest operations ever taken in hand by the State.

Mr. Marsden joined the Secretary's Department of the Lancashire and Yorkshire Railway in 1884, and after gaining experience in Committee and Finance work was transferred to the Chief Traffic Manager's Department in 1900. In 1903 he was promoted to the position of District Goods Superintendent in the Central Division, which includes the most important spinning and weaving areas on the Lancashire and Yorkshire system. Two years later he returned to Headquarters as Assistant Goods Manager of the Company.

It is a remarkable coincidence, in view of Mr. Marsden's new appointment, that one of his forbears was Bishop Marsden, a Colonial Missionary who introduced sheep to the Colonies and brought over to England the first wool crop (in barrels) in 1808, from

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which H.M. King George III. had the first suit made.

The following is a supplementary list of Directors, Officers and Staff of the Great Central Railway holding commissions in His Majesty's Forces :—

Audit Accountant's Department.—G. Pitt, 2nd Lieut., Machine Gun Corps ; J. F. Tew, 2nd Lieut., South Lancashire Regt. ; G. H. Tomkinson, 2nd Lieut., Manchester Regt. ; J. C. Mountain, 2nd Lieut., Reserve Battalion South Lancashire Regt.

Chief Goods Manager's Department — W. Lawson, 2nd Lieut., London R.F.A. ; W. Eddings, 2nd Lieut., Lincoln Regt.

Chief Mechanical Engineer's Department. — H. M. Weyman, Capt., Royal Field Artillery (killed) ; J. M. Edwards, Lieut., Railway Co. Royal Engineers.

Solicitor's Department. — N. G. Flawn, 2nd Lieut., Royal Garrison Artillery ; E. Coleby, Lieut., Railway Transport Establishment.

Stores Superintendent's Department.—C. H. Norman, Lieut., Army Service Corps.

MR. W. A. MARSDEN.
Assistant Goods Manager, Lancashire and Yorkshire Railway.

Superintendent's Department.—C. M. Marshall, 2nd Lieut., Railway Operating Division ; C. C. Turner, Lieut., Army Service Corps ; T. H. Mason, Lieut., Army Service Corps.

Thompson McKay and Co.—T. A. Hawkins, Lieut., Army Service Corps.

The following further members of the staff of the Great Central Railway have been decorated for distinguished conduct, or who have been mentioned in despatches, and reported to the Officers of the Company :—

T. H. Underwood, Traffic Manager Over-Sea—Mentioned in despatches.

General Manager's Office.—H. S. Owen, an Assistant, Marylebone—Mentioned in despatches.

Chief Mechanical Engineer's Department.—S. M. Bowness, Cleaner, Immingham—Military Medal.

Hotels Department.—F. Warren, Warehouseman, New Holland Laundry—Military Medal.

Police Department.—J. F. A. Coates, Police Constable, Grimsby Docks—Military Medal.

Portmaster's Department.—G. Unsworth, Captain—Distinguished Service Cross ; W. G. Wood, Captain—Distinguished Service Cross.

Superintendent's Department. — A. H. Smith, Clerk, Immingham — Meritorious Service Medal.

Thompson McKay and Co.—S. J Sneath, Clerk, Nottingham — Military Medal.

A portrait of Mr. William Cæsar Neate, Rating Surveyor, London and North Western Railway, is reproduced by courtesy of our North Western contemporary. Mr. Neate entered the service of the London and North Western Railway in 1881.

Mr. Neate was an ardent volunteer as far back as 1884, when he joined the 2nd Volunteer Battalion of The Queen's Royal West Surrey Regiment, in connection with which he holds the long-service medal, which in itself requires twenty years' continual service as a qualification. His more recent military achievements have been in

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connection with the Volunteer Defence Movement in Watford and neighbourhood, and he has now been gazetted as Captain in the Hertfordshire Volunteer Regiment.

The Military Medal has been awarded to Corporal J. Burgess, who was a supernumerary porter in the Chief Traffic Manager's Department, Great Eastern Railway,

Private William G. How, of the London Regiment, has been awarded the Military Medal. He was a clerk in the Chief Traffic Manager's department at Bishopsgate (Goods) and has been five years in Great Eastern Railway service.

Corporal Harold Chantrell, of the Field Ambulance, R.A.M.C., has been awarded

MR. WILLIAM CÆSAR NEATE,
Rating Surveyor, London and North Western Railway.
Captain, Hertfordshire Volunteer Regiment.

Bishopsgate (Low Level). Last March it was noted that Private Lawrence Kossak, carriage washer, Stratford, had won the D.C.M. for great gallantry at Bois Français in December, 1915. Now we regret to hear that after being badly wounded in Trones Wood he is missing.

the Military Medal for bravery on the field. He was formerly a turner's apprentice in the locomotive department at Derby, Midland Railway. David McKinnon, who joined the forces in January, 1915, has been awarded the Military Medal for carrying messages under heavy shell fire whilst acting as

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company runner. McKinnon, prior to the war, was a Midland Railway van boy at Liverpool.

Lieut. A. E. Haynes, M.C., of the Royal Artillery, has now been granted his third star. In normal times he is assistant locomotive superintendent, Midland Railway, Leeds.

The following statistics concerning enlisted men from Midland Railway service are worthy of record :—

Number of men who had joined the Colours up to November 11th, 1916..	15,026
Number of men killed in action or died from wounds or disease	835
Number of men reported missing ..	107
Number of men wounded or invalided home	1,816
Number of men reported prisoners of war	140

Mr. O. Hamilton, late a London and North Wes tern Railway Guard, St. Helens, and now serving i n the West Lancashire Field Ambulance, ha s been awarded the Military Medal for brav ery in the Field. Bombardier J. Stafford, who, previous to joining the Colours, was a labourer in the Permanent Way Depa rtment, Whaley Bridge, has been awarded t he Military Medal for distinguished service.

The following is a summary of men from the Accountant's Department, Great Northern Railway, who have joined His Majesty's Forces and those eligible for service :—

		King's Cross Office, including District Auditor's Staff.	Peterborough Office.	Doncaster Office.	Totals.
With H.M. Forces	Officers	3	—	—	3
	Cadets	1	—	—	1
	Rank and File ..	79	13	14	106
	Army Pay Corps..	16	—	—	16
					—126
In Military Hospital—Nurse		1	—	—	1
Prisoners		2 (In Germany)	—	—	3
		1 (Interned in Holland)	—	—	
Discharged		4 (3 returned to service of G.N.R.)	—	—	4
Deaths		6	—	—	6
		113	13	14	140
In Army Reserve		61	6	2	69
		174	19	16	209

Mr. Arnold Clear, Chief Mechanical Engineer's department, Great Central Railway, has been gazetted Captain in the Manchester Regiment, to take precedence from June 13th, 1916. Mr. Clear received his commission in the Manchester Regiment in June, 1914, before the war. He went to Gallipoli in October, 1915, where he was slightly wounded by shrapnel. He was afterwards with his regiment on the Sinai Peninsula, and took part in the battle of Romain. He was attached to the Royal Flying Corps in October last. Mr. Arnold Clear is the son of Mr. E. A. Clear, Assistant to the General Manager, Great Central Railway.

Lieut. Charles Howard Slater, who joined the Irish Rifles shortly after the outbreak of war, and about eighteen months ago went to France in the capacity of a staff sergeant, has received the Military Cross for taking command of his company when his superior officer had fallen. A native of the Derby district, he was formerly engaged with the firm of Handyside, of that town, and afterwards joined the staff of the Chief Engineer, Great Northern of Ireland Railway, Dublin.

Mr. J. A. Jenkinson, Great Central Railway, one of the authors of "Elements of Railway Operating Economics" and "Practical Railway Working," has been granted a commission, and is now stationed somewhere in France, being occupied on duties for which his varied railway experience admirably fits him. As a higher grade student he passed through all departments of railway work, under the scheme of training inaugurated by Sir Sam Fay, and subsequently was engaged on various special duties.

On the Midland and Great Northern Joint Railways the total number of staff serving with the forces up to November 30th was 561. Four have recently been killed in action, one is reported missing, and one has died of wounds.

Among the names mentioned in Field-Marshal Sir Douglas Haig's dispatch for distinguished services and devotion to duty is that of Acting-Sergt.-Major S. Follows, of the Royal Engineers (Railway Operating Division). Prior to entering the Army in

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June, 1915, Sergt.-Major Follows was a Midland Railway Locomotive Inspector at Derby.

Lieut.-Col. John Norman Peck, Liverpool Rifles, who has been awarded the Military Cross, was an engineer with the Lancashire and Yorkshire Railway before joining as a private in August, 1914. His promotion has been rapid, for having passed through the ranks he gained his commission and was gazetted Lieut.-Colonel in September last.

Capt. (temp. Major) H. Smithers, gazetted for duty as Deputy-Director of Railway Transport as from June 14th, 1916, was educated at Charterhouse, where he was a member of the School Rifle Corps. On leaving school, he entered the Volunteer Force, which was merged in the Territorial Force. He joined, in 1907, the battalion of the Royal West Kent Territorial Regiment, went with his regiment to Suvla Bay in August, 1915, where his colonel being wounded a week after landing, he was left in command. On arrival in Egypt he was found to be suffering from a bad foot, which incapacitated him from active service, and he is now filling the post stated. Major Smithers is the third son of Mr. A. W. Smithers, Chairman, Grand Trunk Railway of Canada.

Capt. C. L. Conacher, formerly Traffic Manager, Cambrian Railways, has been appointed an Assistant Director at the Ministry of Munitions, upon assuming the position of chief assistant in the National Filling Factories Administration at headquarters. Capt. Conacher entered the Ministry of Munitions when first formed in May, 1915, after nine months' previous service as a railway transport officer on the War Office staff. He has been engaged in various departments of the Ministry in administrative capacities, and now attains more responsible rank and position.

Sec.-Lieut. Frank Squire Hart, youngest son of the late Mr. W. A. Hart, M.V.O., London Divisional Superintendent, Great Western Railway, has been killed. He was twenty-two years of age, entered the railway service in the Divisional Superintendent's office at Paddington on May 29th, 1911, and enlisted as a private in the Public Schools Battalion, Middlesex Regiment, on September 14th, 1914. He was quickly promoted to the rank of Sergeant, and early in 1916 was invalided home from France, suffering from shell shock. He was gazetted to a 2nd Lieutenancy in the Somersetshire Light Infantry in August last year. Shortly after proceeding to the front for the second time he was killed in action at Gueudecourt (Somme).

The following Great Western men on active service have recently been awarded the Military Medal :—

Second Corporal G. Higgs, R.E. (deal porter, Carriage, Wagon and Timber Department, Swindon), for gallant conduct and devotion to duty in the field, on September 24th–25th, during the battle of Thiepval; Private W. J. Sargent, Gloucestershire Regiment (porter, Traffic Department, Grange Court), for bravery in the field; Private J. Queeney, 2nd Worcestershire Regiment (carman, Goods Department, Wolverhampton); J. E. V. Warfield, R.F.A. (carman, Goods Department, Bristol).

Lance.-Corpl. A. J. Edwards, 19th Batt. Liverpool Regiment (lampman in the Traffic Department at Chester), has been awarded the Distinguished Conduct Medal for gallantry in action. Temp. Lieut. W. J. Cookson, R.E. (clerk, Great Western Railway Solicitor's Office, Paddington), was recently mentioned in despatches.

The Military Medal has been awarded to Sergeant F. J. Cheadle, South Staffordshire Regiment, who was employed as a carpenter in the Great Western Railway permanent-way shop at Wolverhampton; and to Private B. F. Johnson, Duke of Cornwall's Light Infantry, who was employed as a lad office porter in the Great Western Railway Goods Department at Halesowen.

Two members of the Locomotive and Carriage Department staff at Newton Abbot have been awarded the Military Medal. They are Mr. E. J. Richardson, clerk, and Engineman W. H. Palmer. Both joined the Colours in November, 1915, and are serving in the R.A.M.C. in France. Private James Ferris, Gloucestershire Regiment, who was employed as a wharfinger in the Traffic Department at Bullo Pill, has also been awarded the same distinction.

The Committee of the Great Western Railway Fund for Comforts for Railway Troops have expended between £500 and £600 on the purchase of comforts for members of the Company's Staff attached to the Railway Troops, of which there are now approximately 1,700.

Lance-Corporal G. Pritchard, Royal Engineers, Egyptian Expeditionary Force (clerk in the Traffic Department at Ruabon), is included in the list of those specially mentioned by Sir Archibald Murray.

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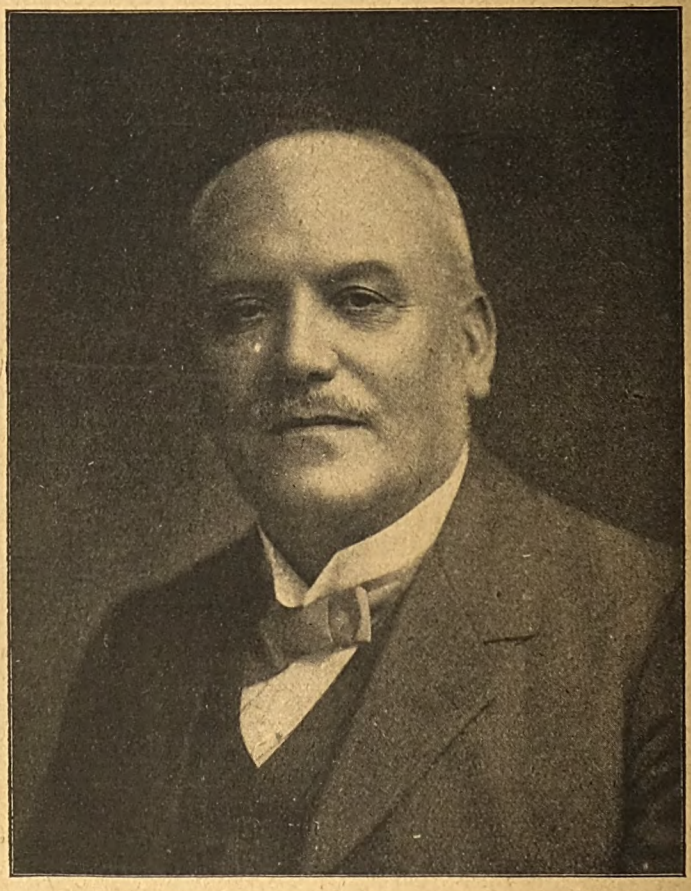
North British Railway Staff Changes.

LAST month brief particulars were given of the changes made, as from January 1st, 1917, in the department of the Superintendent of the Line, North British Railway, whereby Mr. John Black, Superintendent, has retired after 46 years' service, and the Directors having decided to divide the work of the department, Mr. William Strang, Chief Assistant to Superintendent of the Line, becoming Commercial Superintendent, and Mr. Charles H. Stemp, Outdoor Assistant to Superintendent of the Line, Operating Superintendent.

The division of work entailed by these changes was outlined last month, and brief particulars of the gentlemen referred to given. We are now able to supplement this with more detailed reference to the railway biographies of Messrs. Strang and Stemp, at the same time reproducing portraits of Mr. Black and of the two new officers.



Photo] [*Elliott & Fry.*

MR. JOHN BLACK,
Late Superintendent of the Line, North British Railway.

Mr. Strang is a native of Dunfermline, and started in railway service as a junior clerk with the Leven and East of Fife Railway, who owned a small line extending from Thornton to Anstruther, a distance of about

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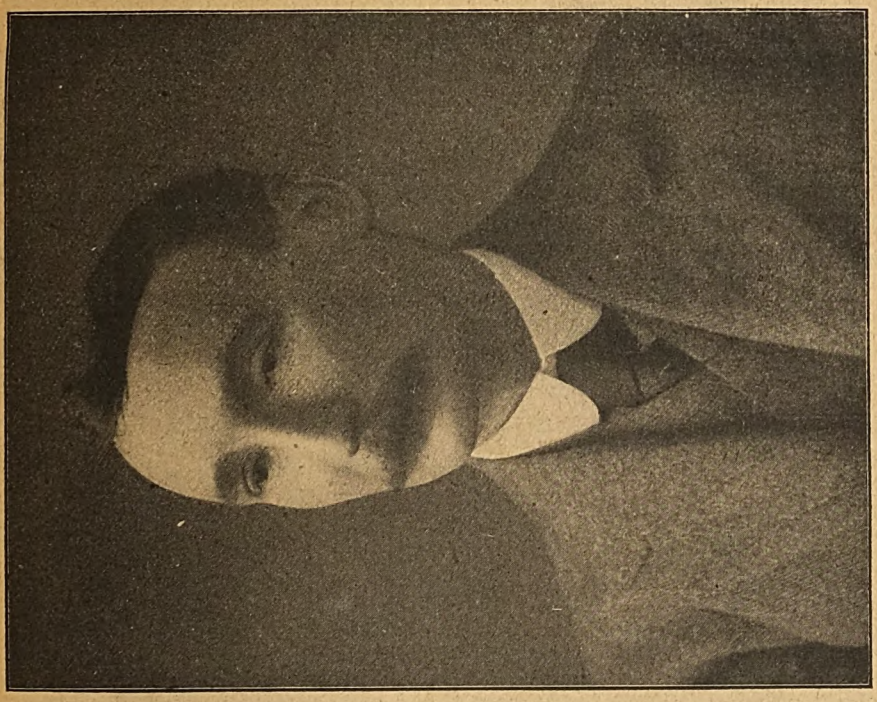
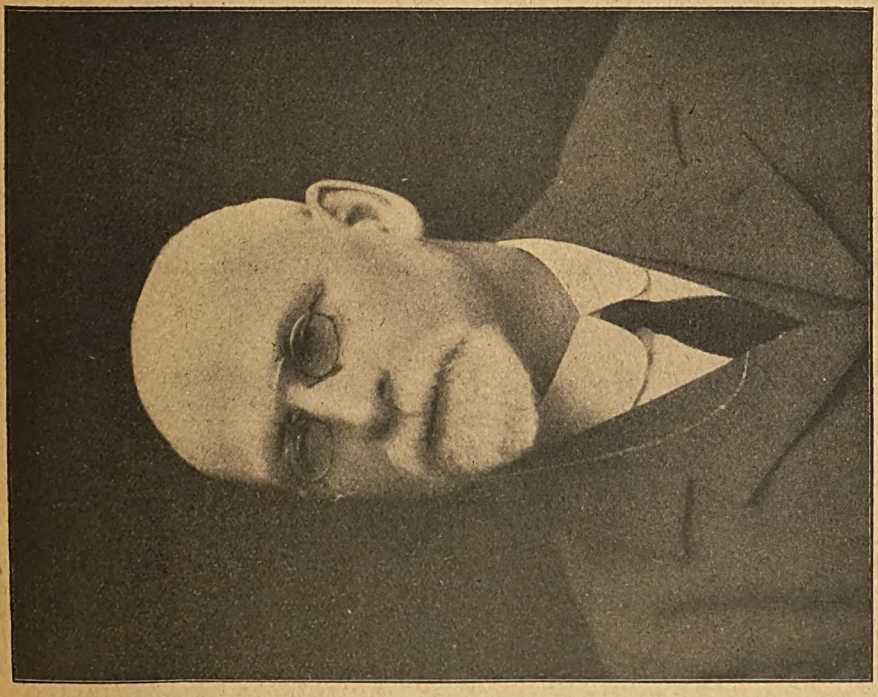


MR. C. H. STEMP,
Operating Superintendent, North British Railway.



MR. W. STRANG,
Commercial Superintendent, North British Railway.

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19 miles. This line was amalgamated with the North British Railway in 1877. Mr. Strang served as Stationmaster at various stations, including Newington, Dunfermline Lower, and Linlithgow. From the latter place he came to Edinburgh, and acted as Parcel Agent at Waverley station for a number of years, after which he was appointed District Traffic Superintendent at Burntisland. Subsequently, he returned to Edinburgh as Chief Assistant to the Superintendent of the Line, which position he occupied for the five years preceding his new appointment.

Mr. C. H. Stemp is 45 years of age and entered the service of the Great Eastern Railway in 1885 as a Junior Clerk. After passing through various grades on the Western Division of that Railway, he was transferred to the Northern Divisional Superintendent's Office, and thereafter to the Traffic Working Department in the Headquarters' Offices at Liverpool Street under Mr. R. P. Ellis, Superintendent of the Line. Later he was appointed a first class Stationmaster in the London District.

On a request from the Directors of the North British Railway, Mr. Stemp was selected to come North, and was appointed Traffic Working Assistant to the then Superintendent of the Line, Mr. Deuchars. On that gentleman's retirement he was appointed by the Directors as Outdoor Assistant to the new Superintendent of the Line, Mr. Black, who has now retired in his turn.

As Operating Superintendent Mr. Stemp has full control of the working, including goods, passenger, mineral, etc., and all the staff in connection therewith; also the distribution of all classes of plant, both goods and coaching. We understand that he had a great deal to do with the improvement which has taken place in the Goods and Passenger train working on the North British Railway of late years, as well as with the introduction of the Train Control, the North British being the only railway in Scotland operating that system. This has proved eminently successful, so much so, that the Directors have sanctioned its extension to embrace practically the whole system.

It may be mentioned that the North British Railway have been appointed as the Secretarial Company in Scotland in connection with the Railway Executive Committee, and Mr. Stemp is the Officer appointed to deal with Naval and Military matters.

DON'T FORGET
YOUR FRIEND
IN THE FORCES.
SEND HIM A
RAILWAY MAGAZINE.

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"Making of the South Western Electric."

UNDER this title a film has been issued by the publicity department of the London and South Western Railway for exhibition at picture palaces and cinematograph theatres. The preparation of this was commenced over three years ago, and so much had been done before the war and during the earlier stages that the department has been well-advised to complete the full scheme and render it available for public exhibition as a high-class educative film showing all stages of the work leading up to the culmination of the remarkable suburban electrification undertaking which now concentrates upon Waterloo, incidentally providing most generous facilities for business and residential travel, and, as completed, releasing no small numbers of steam locomotives and rolling stock for use elsewhere.

The idea of the film is to indicate to the general public what such an undertaking involves, and for that reason sections deal with such matters as the excavation of the foundations of the power house, its erection and equipment, and the work of laying the cables and installing and connecting up the conductor rails, as well as the working of the trains and aspects of the completed undertaking.

A series of views selected from the film are reproduced on the opposite page.

The film, each section of which is about 650 ft. in length, includes explanatory insets as usual, and the inscriptions may be reproduced, with notes as to what each section covers.

This film has been shown at several places in the Metropolis, and arrangements have been made for its being exhibited at many other centres, town and provincial. Naturally, it appeals very strongly to regular travellers who have seen all stages of the work, and now travel by South Western electric; but from the point of view of educative value and interest the film should be highly appreciated everywhere. There is, indeed, good reason for urging that for our picture houses to really justify themselves there should be much more material of this or kindred character, and the London and South Western Railway is doing good service in rendering available such a film as this.

Part I.

Explanatory Notes exhibited on Screen.	*Remarks Concerning Views.*
	Map of route.
In the old days we had to scurry over breakfast to catch our business train. Missing it meant waiting.	People on platform waiting. Steam train approaches and leaves.
Now we are always sure of a frequent '. '. . .	Electric train approaches.
. . . And speedy service.	Electric train rapidly leaving station—also view of comfortable interior.
Little do we realise as the car glides smoothly over the rails all the trouble and inventive genius which has been expended on our transit.	Brief view showing electric railway.
First a power-house had to be built, 260 ft. long, with chimneys 230 ft. high	Views of early construction of power-house—digging foundation. Chimneys nearly completed.
In which to house the sixteen boilers, each evaporating 20,000 lb. of water per hour.	View of boilers.
The proper supply of water necessitated the construction of a series of weirs and cooling towers.	Showing weirs and cooling towers.
Special provision also had to be made for the stacking of coal.	Unloading and stacking coal.
A peep inside the power-house shows the switchboard and controls	View of switchboard and controllers.
And the powerful dynamos which generate at 11,000 units the electrical energy	Dynamos.
Which drives the train along.	Track seen from train passing completed power-house.

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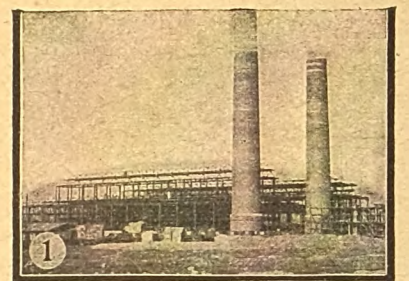
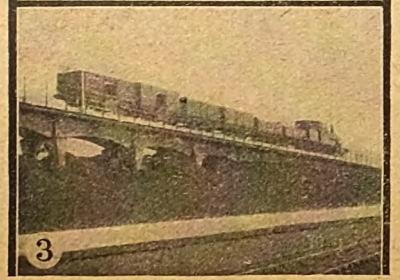
SCENES FROM THE LONDON AND SOUTH WESTERN FILM.





(1) Power-house in Course of Construction.

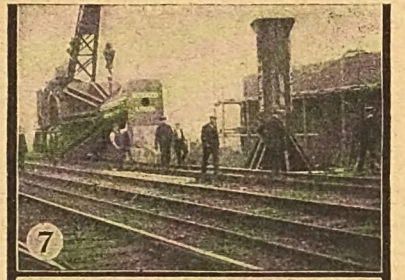
(2) Dynamos in Power-house.

(3) Coal Stage.

(4) Driving Cable Posts.

(5) Unwinding and Laying Cable from Cable Train.

(6) Laying Track Insulators and "Live" Rail.



(7) Construction of "Fly-over" Viaduct at Hampton Court Junction.

(8) Riverside Scenes as seen from Observation Car.

(9) Near Clapham Junction, with Twenty Tracks.

(10) Interior of Power Signal-box.

(11) Scenes at Waterloo.

(12) Women Carriage Cleaners at Work.

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Explanatory Notes exhibited on Screen.	*Remarks Concerning Views.*
This current of energy has to be transported by means of cables laid alongside the railway. First, thousands of posts must be driven, and the cable fixed.	Driving of posts. Cable train. Unwinding and fixing cable.
Then along the track insulators must be placed to carry the "live" rail.	Bringing up insulators.
And here we see how the "live" rail is laid upon the insulators.	Laying rails on insulators.
This "live" rail acts the fairy godmother and carries our train to its destination	Short trip on electric.
But to complete the electric circuit the ordinary rails have to be joined by copper bonds.	Bonding.
To receive the bonds, thousands of holes have to be bored in the rails, by hand and pneumatic drills.	Drills at work.
Here we see one of the copper bonds used for connecting the track rails.	Bonds.
The train obtains its current by means of a collecting shoe, which "glides" over the "live" rail.	Shoe.
And here we see the motorman applying the current. Should he relax his hold of the "dead man's" handle, the train would stop, ensuring "safety."	Views of Motorman.

PART II.

To carry the electric line to Hampton Court over the main line, a "fly-over" bridge had to be constructed near Surbiton.	Views of arches being erected.
Huge colums are required to hold up the massive girders.	Bringing column up on train and raising it into position.
Bridge completed and main line express passing underneath.	View of bridge and main line express.
Now for a brief trip on the electric, showing some riverside scenes at Kingston, Richmond and Barnes.	Three small sections, showing Kingston, Richmond, and Barnes bridges.
Electric trains passing the world's busiest railway centre—Clapham Junction—twenty tracks carrying over 1,500 trains per day.	View from signal box of tracks at Clapham Junction, with electric trains.
A modern signal box at Clapham Junction, showing how the trains are controlled.	Interior of Clapham East signal box, showing power signal frames.
An engineering triumph. The enlargement of Waterloo Station without interruption of traffic.	"Panoram" view of Waterloo from "A" box.
City workers arriving by electric at Waterloo, London's finest railway station.	Views of arrivals and concourse at Waterloo.
After its daily run, each train goes to sheds for overhauling and cleaning.	Berthing sheds and women cleaners at work.

The Western Lines of the London and South Western Railway. [No. III.]

By J. F. GAIRNS.

The above article will appear in the next issue of the RAILWAY MAGAZINE.

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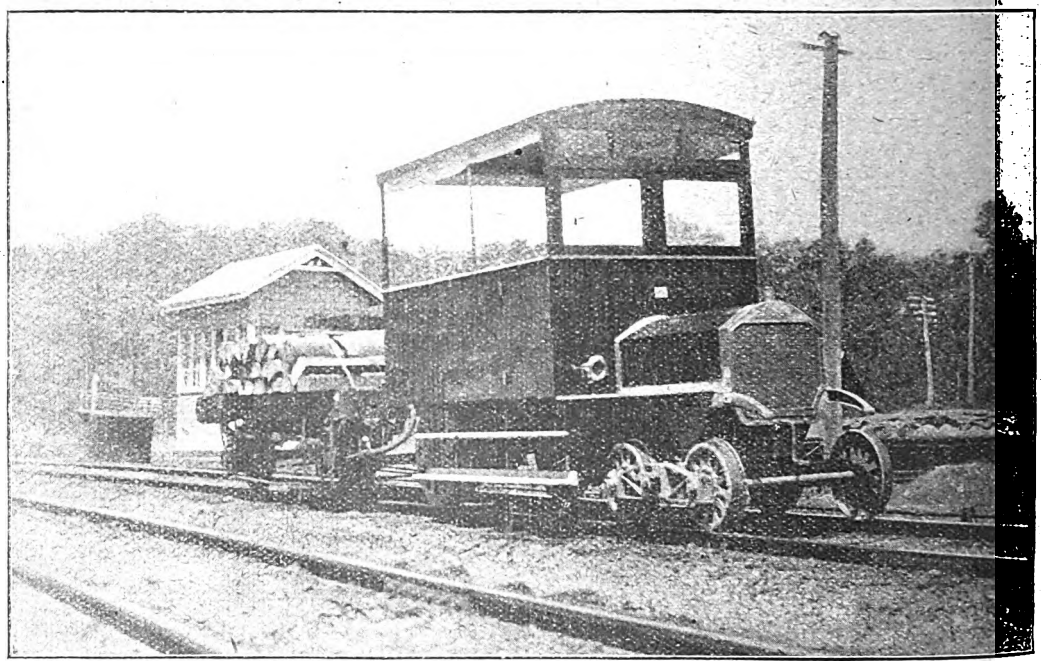
Road Motor Cars on Rails.



IN the December RAILWAY MAGAZINE we illustrated a Napier motor car operating in Canada as a railway train, and running on rails. Another instance of a corresponding adaptation, though for a different purpose, can now be referred to.

This car is a 45 horse-power Napier vehicle supplied to the Railway Commissioner of Queensland some four years ago. It has completed considerably over 100,000 miles, comprising mainly long country tours, and has twice negotiated the country surrounding the Gulf of Carpentaria.

As a result of conversation with Commissioner Evans, the idea was conceived to make an experiment with this car, and to convert it into a railway motor for conveying passengers and haulage on the Cooktown to Laura Railway. The work of alteration was carried out at the Ipswich Railway workshops, the first test in conjunction with the officials of the railway department.

The trial trip took place from Ipswich to Laidley. At Grandchester a hopper wagon underframe was attached, loaded with sleepers. The Little Liverpool range, which includes a 1 in 25 incline, was negotiated with comparative ease at a speed of 20 miles per hour. Although the car left 15 min. late, she arrived at Laidley on time, and during the return journey a speed of 37 miles was maintained. It was found unnecessary to use lower than second gear, and the petrol consumption worked out at slightly over 30 miles to the gallon.

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The Why and the Wherefore.

For several years a section under this title was a standard feature of the RAILWAY MAGAZINE. *During the intervening period queries have received attention in "Pertinent Paragraphs," or have been replied to by post; but the topics dealt with are frequently of wider interest, and in response to requests from many quarters, it has been decided to reintroduce the "Why and the Wherefore" pages. Queries must not, however, be of purely local application, nor can lists of engines be supplied. Readers desiring information should mark envelopes "Query" in the upper right-hand corner.*

Great Northern 8-feet Singles.

There has probably never been a more popular class of engine than these. Years ago there were as many models of this class as of all others put together, and at King's Cross the engines always aroused interest. Unless one or two still remain on the duplicate list, they have all gone to the scrap-heap, though the shell of No. 1 (the pioneer of the type) is, we believe, still preserved in the workshops at King's Cross engine shed. In their prime they worked all the principal main line trains, and did marvellous loads. The first sign of their coming displacement was the use of two on one train, never seen until loads began to be too much for them. The class was fully dealt with in Mr. Ahron's articles published in the RAILWAY MAGAZINE for June, 1915.

[Reply to W. V. AMOS.]

2-4-0 Tank Engines: Great Eastern Railway.

Officially the Great Eastern Railway has no 2-4-0 tank engines, but when the loads on the Fenchurch Street–Blackwall route were reduced some years ago the front sections of the coupling rods were removed from the small 0-6-0 tank engines used for this service, and they have run in this condition for a long period. They rank, however, as 0-6-0 engines, and others of the class used elsewhere are, we believe, still operated as such. The class is considerably smaller than the usual 0-6-0 condensing and goods engines used elsewhere in the London district. We may mention that some of the 0-6-2 tank engines on the London, Brighton and South Coast Railway ran for a considerable time as 2-4-2's, but were never so classified officially.

[Reply to NORMAN H. BAYLEY.]

Valve Gear of Great Western Railway Four-cylinder Locomotives.

These engines have only two sets of valve gear, and the valve rods for the inside cylinders are extended through the front end of the steam chest and then coupled through a lever to the valve rod of the adjacent outside cylinder, which rod is therefore operated reversely and from the front end of the engine. A portion of the lever and its connection to the valve rod can be seen in most illustrations of these engines. Some of the older locomotives of this line still have a pump, operated by a connection from the cross-head, which is used in place of the small ejector of the vacuum brake. This is probably what is referred to in the query.

[Reply to ERIC J. PEARCE.]

Simultaneous Train Departures.

It must be obvious that the total number of trains which can leave a given station simultaneously is governed by the number of routes available. Eight platforms leading into two tracks at each end would, of course, only allow of four trains leaving simultaneously, and not then if any of the routes conflict. At a station like Harrow and Wealdstone (London and North Western Railway), as the three through sets of lines do not conflict, three up and three down trains can leave at the same time, while the Stanmore branch train can also depart independently, making seven. At Clapham Junction there may be four trains on the Brighton side, four on the main line section of the London and South Western Railway station, four on the Windsor side, and possibly one towards Addison Road at either extreme of the station, but a train towards Wandsworth (London, Brighton and South Coast Railway) cannot leave from the West London Extension side at the same time as a down Brighton local train, and similar remarks apply on the South Western side at the other extreme of the station.

[Reply to J. A. ELLIS.]

Railway Electrification.

The War has stopped many developments, and particularly in regard to electrification of railways; but even with considerable extensions of electrical working on the suburban lines of the London, Brighton and South Coast Railway it was hardly likely that the whole of the main line services could have been so worked for some time ahead, and in any case it would have been necessary to develop the steam locomotive stock as long as there was any work calling for their employment. We understand that the Newport-Shildon electrification, North Eastern Railway, is working well, and no doubt other sections will be equipped in due course.

[Reply to J. HOCKENHULL, Jun.]

Dual Brake Fittings.

The Westinghouse was the first continuous brake to be extensively employed in the United Kingdom—several others had, however,

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been used to some extent—and was installed on several lines which are now "vacuum" railways. With the development of the vacuum brake, however, mainly in British hands, that gradually became more and more widely used, and now the Westinghouse lines constitute a minority here. But as it has been continued by a number of leading lines, it has become necessary to provide a large number of vehicles employed on joint services, particularly for joint stock, with fittings whereby either apparatus will operate the brake gear, and sometimes both will be in use during a single journey, vacuum one section, and Westinghouse another. As the Highland Railway has to receive vehicles from the Great Northern, Midland and London and North Western as vacuum railways, and from the North Eastern, North British and Caledonian as Westinghouse lines (individual vehicles as well as joint stock), it is obvious that it is essential that the engines shall be able to operate either form of brake, or that the vehicles must all have vacuum apparatus, that being the standard on the Highland Railway. Most of the through vehicles are dual-fitted; but sufficient Westinghouse stock also gets on to the line to justify some of the engines being dual-fitted. There is little to choose between the two brakes in regard to efficiency; but the elimination of one is rather too big an undertaking. [Reply to J. DICKSON.]

Locomotive No. 1.

Mr. J. Bond, of Rochdale, states that No. 1 on the Lancashire and Yorkshire Railway is a 0-6-0 Class A superheater goods engine, and asks to what shed this engine is attached. Mr. J. Hayes writes that No. 1 on the North Eastern Railway is now one of the electric locomotives working on the Quayside branch, Newcastle-on-Tyne. No. 355 (class F1, 4-4-0) was No. 1 until renumbered in 1915.

Miscellaneous Replies.—[R. BATES.]—The station you mention will receive attention in due course. Mr. Ahrons' articles are, judging from correspondence, highly appreciated, and we are glad to have your commendation in addition. [LIEUT. P. K. B. REYNOLDS.]—Your suggestion will be adopted shortly, but on the basis of later statistics which will soon be available. [NORMAN H. BAYLEY.]—The Somerset and Dorset Joint Railway makes connection with the West of England main line of the London and South Western Railway at Templecombe. It is the Midland and South Western Junction Railway whose trains use Andover Junction. Certain of their trains also run on to Southampton, over the London and South Western Railway, whereas Somerset and Dorset trains work into Bournemouth West. There may be a few of the Midland 4-4-0 Johnson engines yet unrebuilt, but we have not seen or heard of one for a long time past. Many thanks for your kind remarks in reference to the RAILWAY MAGAZINE and its contributors. [T. G. FENDICK.]—Mr. Allen last month discussed the question as to which is the heaviest British 4-4-0 engine. Of all types, No. 111 *The Great Bear*, Great Western Railway, is necessarily the heaviest. The weight of the "Sir Sam Fay" class, Great Central Railway, is 79 tons, apart from the tender. ["CANADIAN READER."]—The Leeds and Liverpool Canal has a total length of 144¾ miles, but has many sections besides that forming the ordinary route between Leeds and Liverpool. By rail the distance between these two towns is: London and North Western Railway, 74½ miles; Lancashire and Yorkshire Railway, 85½ miles. [W. WHITE.]—There is nothing distinctive about the bridge carrying the London and North Western Railway from Anglesea to Holy Island (for Holyhead). It is an ordinary iron bridge, with a road bridge adjacent. [J. ANDREWS.]—All the information you seek can be easily gleaned from the Railway Year Book. The new edition for 1917, which will be the 20th annual issue, is in preparation for publication as soon as the final figures for 1916 are available, but in the meantime the 1916 book can still be supplied.

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Railway Literature.

THE RAILWAY SIGNAL AND PERMANENT WAY ENGINEER'S POCKET BOOK. [Locomotive Publishing Co., Ltd. 2s 6d. net.] For some years these publishers have issued handy pocket books dealing with locomotive engineering and with carriage and wagon building. They now add a third, in two sections, devoted respectively to signalling and to permanent way. A third part contains pages of squared paper and tables of British measures with their metric equivalents. In the first section details of construction and their application in actual daily working are dealt with, including various systems of power signalling as well as manual practice. The second part gives useful data and stresses for track and engineering works, durability of materials, and so forth. Prominent place is given to the more important Board of Trade regulations and restrictions that affect railway engineers. Paper, type and binding are good, and the illustrations and diagrams, of which there are a large number, are well selected and clearly drawn. The book is of handy size and shape for the pocket, and has a serviceable binding.

* * *

THE RAILWAY CARRIAGE AND WAGON BUILDER'S POCKET BOOK AND DIARY: 1917. [The Locomotive Publishing Co., Ltd. Price 2s. 6d. net.] The new edition of this useful volume has been brought up-to-date and revised as necessary. It may be commended to all interested in the carriage and wagon side of railway engineering.

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THE BRITISH DOMINIONS YEAR BOOK, 1917. Edited by Edward Salmon, F.R.C.I., and James Worsfold, F.C.I.S. [The British Dominions General Insurance Company, Limited. Price 2s. 6d. net.] Issued as a Year Book dealing with general affairs, the war and national problems necessarily figure largely in this useful volume, and there is much valuable reference material, while the reproductions in colour of insignia of Orders of Knighthood, decorations of honour, regimental colours, house flags of steamship companies, etc., and the maps included are features of special note. The frontispiece is a fine portrait of His Majesty King George. Contents include a wide selection of articles, together with reference material. The article which should appeal most to us is that by Lord Headley on "The Civil Engineer and the Future." With this we must confess considerable disappointment. The title is justified by the extended reference to the Channel Tunnel, as also the section dealing with Falmouth Port and Docks; but the whole of the remaining subject matter consists of belaudation of the Gattie Goods Clearing House and equipment. Mr. Gattie may be complimented upon his thus securing a good advertisement of his scheme, notwithstanding that it is not civil engineering, except in that it would involve structural work and approach railways, and he has attained this publicity in an article which professedly should not include such subject matter and at the expense of material which should be dealt with, according to the title. That this is realised is indicated by the Editorial Addendum dealing with canal transport. As for the Gattie section of the article, all the old material is again presented in the same way as heretofore, all the real problems of railway traffic being carefully ignored, and certain features magnified as if they characterised all sections of goods traffic, instead of a proportion only and that which is easiest to deal with according to normal methods.

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MY HOLIDAYS ON INLAND WATERWAYS. By P. Bonthron. [Thomas Murby & Co.] An interesting record of 2,000 miles coursing by motor boat and pleasure skiff on the canals and rivers of Great Britain. With 74 illustrations and map. Several of the canals traversed are railway-owned, such as the Kennet and Avon (Great Western Railway), Grantham Canal, Witham Navigation and Forth and Clyde Canal (North British Railway). The author in several places deplores the lack of canal development, and suggests that railway competition is at least partially responsible. We would remind him that in several instances the railway companies were compelled to purchase these canals, but it does not follow that their now limited use is the result of adverse administration. Some of these canals are well looked after in railway hands, and it is the changes in the times and in conditions which have reduced their traffic.

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RAILWAY YEAR BOOK, 1917. [Railway Publishing Company, Ltd., 30, Fetter Lane, London, E.C. 2s. 6d. net, by post U.K. 2s. 11d.; abroad 3s. 2d.] The issue for 1917, now in preparation, will be the twentieth annual edition. It is expected to be ready for publication before the end of March. By reason of the War a vast amount of revision has become necessary.

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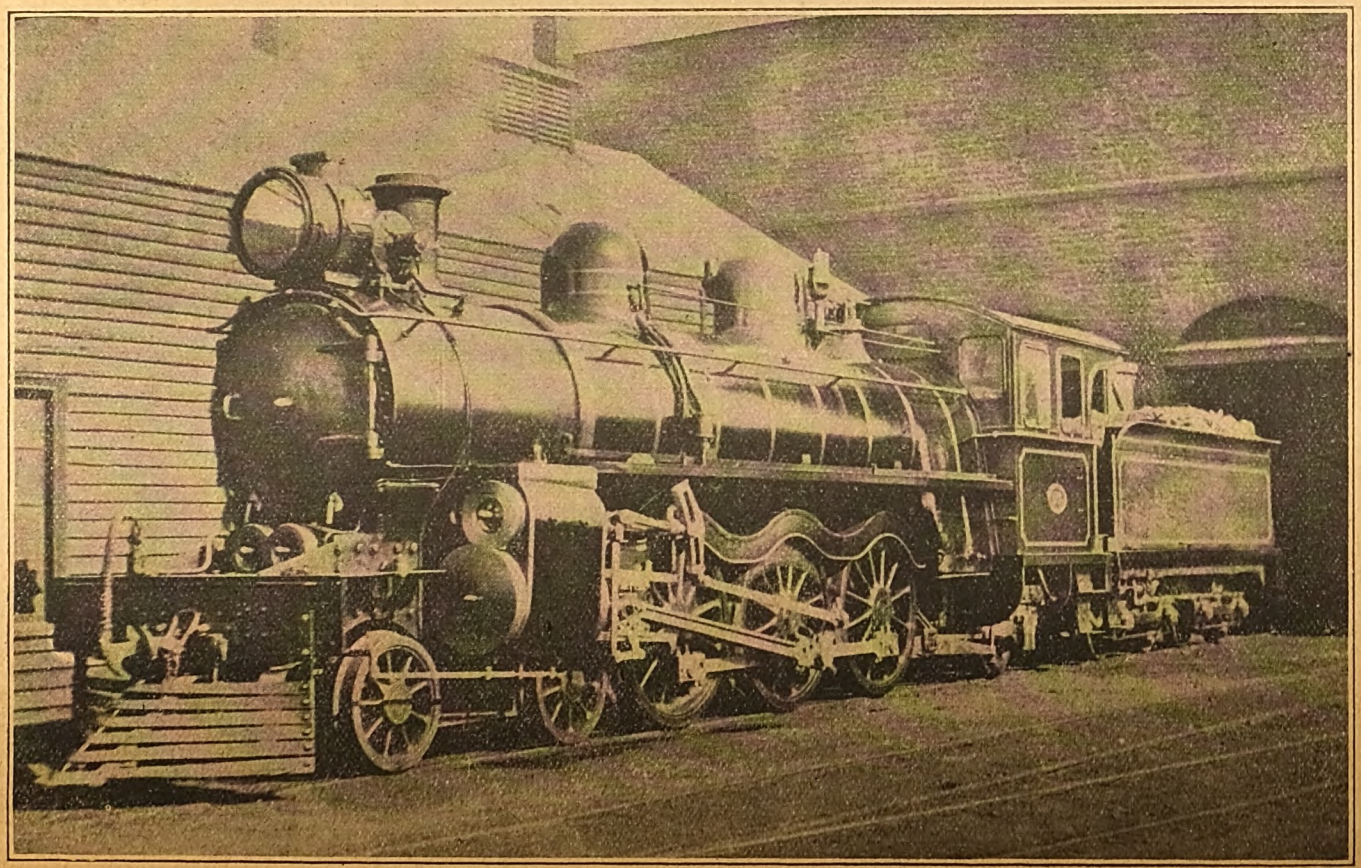
4—6—2 BALANCED COMPOUND LOCOMOTIVE: NEW ZEALAND GOVERNMENT RAILWAYS.



We are indebted to Mr. W. Stewart for illustration and particulars of this notable engine designed by Mr. A. L. Beattie, late Chief Mechanical Engineer, and built at Addington Works. The gauge is 3 ft. 6 in. Leading dimensions are: Cylinders, H.P., 12 in. by 22 in., L.P., 19 in. by 22 in.; coupled wheels, 4 ft. 6 in.; steam pressure, 225 lbs. per sq. in.; total heating surface, 1,724 sq. ft.; grate area, 30 sq. ft.; total weight in working order, 72 tons. Our correspondent states that this engine reached a speed of 51 miles per hour between Christchurch and Ashburton. The large electric headlight has been replaced by one using acetylene.

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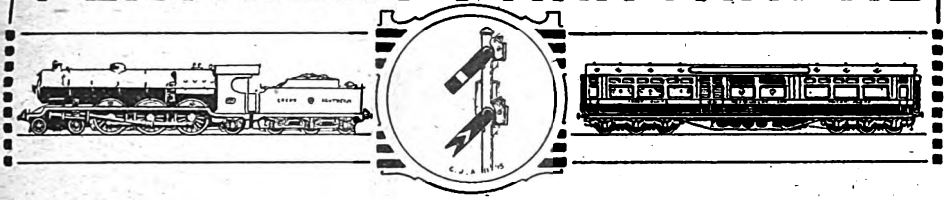
PERTINENT PARAGRAPHS



Railway Reports, 1916.

"OMITTED under Authority of Board of Trade" is the phrase adopted to indicate that the whole of the Statistical Returns which constitute Part II. in the specified form in which the railway reports have been presented since the Railway Accounts and Returns Act came into force, are omitted. Therefore, the only tables now included are those relating to Capital and Loans, Receipts and Expenditure on Capital Account, Revenue Receipts and Expenditure on the Whole Undertaking, Proposed Appropriation of Net Income, Statement of Interim Dividends Paid, and General Balance Sheet. Most of the railways have declared dividends similar to those of a year ago. A notable feature, is however, that in the case of the Hull and Barnsley Railway a rate of 3 per cent. replaces one of 2 per cent. for 1915. Several reports mention also that to provide against one of the hardships which the Government guarantee introduced, that no benefit could be had from special expenditure on new works, though the additional capital obligations thereof had to be met, arrangements have been made whereby interest is now allowed upon capital expenditure where works have been brought into use since December, 1912. The companies still continue to bear 25 per cent. of the total amount of the war bonus granted to employés in February, 1915, who came within the Railway Concentration Scheme; but the war bonus to other employés and the subsequent increases in the war bonus generally are borne as working expense by the Government.

Charing Cross Railway Bridge.

THIS has figured prominently in connection with South Eastern and Chatham Railway and Kentish affairs, in view of the re-presentation of the railway companies' bill in Parliament providing for the strengthening of the bridge. A conference of Kentish Mayors was held at the County Hotel, Canterbury, on January 17th. The Mayor of Folkestone (Sir Stephen Penfold) presided, and there were also present the Mayors of Canterbury, Faversham, Chatham, Margate, Ramsgate, Tunbridge Wells, Gillingham, and Hastings. Following this, the Managing Committee of the South Eastern and Chatham Railway received a deputation at the Charing Cross Hotel, on Friday, January 26th, of Mayors of the boroughs of Kent. The members of the Committee and officials present were: Mr. H. Cosmo O. Bonsor (Chairman, South Eastern Railway), Mr. Alfred W. Smithers, Lord Hothfield, Lord Chilston, Sir Francis Dent (General Manager), Mr. Chas. Sheath (Secretary, South Eastern Railway), and Mr. P. C. Tempest (Chief Engineer); and the deputation included the Mayors of the following boroughs: Folkestone (Sir Stephen Penfold, and the Town Clerk, Mr. Kitson), Dover (Mr. E. Farley), Margate (Alderman Booth Keane), Ramsgate (Alderman J. S. Chayney), Chatham (Alderman W. Paine), Tunbridge Wells (Mr. Charles D. Emson), Gillingham (Alderman W. H. Griffin).

At both these meetings strong representations were made in favour of the work desired to be carried out, and that a decided injustice had been done by the action of the House of Commons in rejecting the bill presented last year in view of an intangible scheme for beautifying the Metropolis, which scheme had not even been properly formulated, besides which it could not be realised for many years to come and would involve enormous expenditure. On Tuesday, January 30th, a Wharncliffe meeting of South Eastern Railway shareholders was held at Cannon Street Hotel to approve of the bill to be reintroduced in the forthcoming session of Parliament, there being a large attendance of shareholders. In his speech as Chairman, Mr. Cosmo Bonsor showed that when the bridge was first put up the South Eastern Railway were practically ordered by Parliament to go to the West End. The Directors of that day were obliged to call their proprietors together (in 1857), and recommend them to promote or concur in the prosecution of a scheme which would effectually supply access to the West End of London, and so complete the system of railway accommodation for Kent and the Continent. Thus the South Eastern Railway embarked on an immense expenditure, amounting to 5 millions sterling, to extend their line from London Bridge to the present station at Charing Cross. The expenditure was too great to have ever made it a paying proposition for the shareholder, but the public in all these years has had a priceless advantage of access to the best situated station in London. In 1906 the South Eastern Railway applied to Parliament and was given powers to widen both Charing Cross Bridge and station at a cost of £750,000.

The Work to be Done—*versus* a Visionary Scheme.

"THIS scheme was not proceeded with," Mr. Bonsor explained, addressing the shareholders, "as a great change occurred in the distribution of

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traffic owing to the extension of the tramways and motor 'bus services; the near suburban traffic from such places as New Cross, Lewisham, Deptford, Greenwich, falling off very considerably. Suburban services were therefore modified, greater attention being paid to places further afield, and it was found that if the present bridge could be used to its full capacity, no further alterations, beyond the strengthening of the bridge, would be necessary. To carry out this, only the sum of £167,000 is necessary to be spent."

"These necessary business arrangements, conceived on sound lines and passed after careful examination by the House of Lords, were all thrown over by the House of Commons refusing a second reading to the Company's bill on the ground that Charing Cross Bridge being ugly, it should be taken away and the station placed upon the south side of the river."

"There is no plan in existence," continued Mr. Bonsor, "as to how this should be done, and it is not conceivable that it can be done in at least twenty to twenty-five years, and at an expenditure of twenty millions sterling. We contend that the time that must elapse before such a scheme can be carried out and the difficulties accentuated by the disastrous conditions caused by the war, render it absolutely necessary that the Company should be allowed to strengthen the bridge even in the interests of the safety and convenience of the travelling public alone. That to our mind is an all-sufficient reason, and we do not at present go into the question of the great injustice of Parliament suddenly going back on its request to the Company in 1857, confirmed by its further assent of the Company's proposals to widen both the bridge and the station as late as 1906. It is unthinkable that Members of Parliament, when they fully understand the position, should not realise that they had been misled in the last session, and now allow the Company to proceed with the work. We must again emphasise the fact that however desirable it may be thought in the future to undertake the ambitious schemes that have been referred to, there is nothing in the bill which prevents those schemes being carried out when they are in a state to be presented to the examination of Parliament, but the necessity remains of carrying the traffic without interruption, and that can only be done by assenting to the Company's bill."

The Institution of Locomotive Engineers.

On Saturday, January 27th, the annual general meeting of the Institution was held at Caxton Hall, Westminster, Mr. R. E. L. Maunsell, Chief Mechanical Engineer, South Eastern and Chatham Railway, retiring President, in the chair. The Hon. Secretary and Treasurer, Mr. G. F. Burtt, presented the annual report and statement of accounts. Both are very favourable, and indicate that, had conditions been normal, the Institution would have made very considerable progress. As it is, there has been a satisfactory addition to the membership of the Institution, the full programme of meetings has been carried out, and the financial position is good.

Mr. Maunsell announced that after obtaining an independent valuation of the papers read during last year, which entirely agreed with his own, the first premium would be awarded to Mr. Smith Mannering, Locomotive Department, London, Brighton and South Coast Railway, Brighton, for his paper on "Locomotive Fireboxes"; the second premium to Mr. Dendy-Marshall, for his paper on the four-cylinder system associated with his name; and the graduates' prize, offered by the President, would go to Mr. E. H. Barnes, of Eastleigh. In the latter case only one other graduate's paper had been offered, and that was not completed as the author had joined His Majesty's Forces, but Mr. Maunsell emphasised the quality of Mr. Barnes' paper, and that it had produced one of the best discussions of the year, so that the premium was well earned, although there had been no competition for it.

It was then announced that the new Vice-Presidents for 1917 were as follows: Mr. H. Kelway Bamber, M.V.O., The Leeds Forge Company, London; Mr. W. A. Lelean, M.I.Mech.E., Locomotive Department, Messrs. Rendel, Palmer & Tritton, Westminster; Mr. M. F. Ryan, A.M.Inst.C.E., Assistant Chief Mechanical Engineer, London and South Western Railway, Eastleigh; Mr. R. P. C. Sanderson, European representative, Baldwin Locomotive Works, Westminster; Mr. R. Wright, Director, Nasmyth, Wilson & Company, Manchester.

New Officers of the Institution.

The death of Mr. R. H. Burnett, London representative, Messrs. Beyer Peacock & Co., and first Locomotive Superintendent, Metropolitan Railway, rendered it unnecessary to take a vote upon the nominations previously made, and therefore those five gentlemen, together with Mr. C. A. Suffield, United States Metallic Packing Co., Ltd., were declared elected. Alteration of bye-laws raising the number of ordinary members of Council from 12 to 14 was accepted, and the following eight gentlemen were declared elected, together with six members not due to go out of office: Mr. A. R. Bennett, M.I.E.E., Westminster; Mr. J. Clayton, Chief Draughtsman, South Eastern and Chatham Railway, Ashford; Mr. H. Woodgate Dearberg, Locomotive Department, Beckton Chemical Works; Mr. R. Dougal, London representative, Messrs. Nasmyth, Wilson & Co.; Mr. J. F. Gairns, Editor Railway Magazine and *Railway Year Book*; Mr. A. T. Houldcroft, Manager, Steel Rolling Stock Department, The Leeds Forge; Mr. J. M. Jackson, Chief Draughtsman, Locomotive Department, London, Brighton and South Coast Railway, Brighton; Mr. G. Mitchell, M.I.Mech.E., Managing Director, The Vacuum Brake Company, London.

This, together with votes of thanks to the retiring President, with due acknowledgment of

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the services he had rendered during the year, despite the heavy calls upon his time in national interests, and to the Hon. Secretary and Treasurer, and other officers, concluded the formal business. Mr. Maunsell then explained that owing to a sudden illness in his family the new President, Mr. A. D. Jones, Outdoor Locomotive Superintendent, South Eastern and Chatham Railway, had been most reluctantly compelled to be absent. Therefore, he could not be formally inducted, but Mr. Jones had written expressing the hope that he would be able to attend a good proportion of the forthcoming meetings. He had, however, sent along the address he had intended to deliver, and this was read by the Secretary. As the chief of a running department, and virtually the only one in the United Kingdom which is not associated directly as part of the locomotive department or of a traffic department, Mr. Jones dealt with the subject upon which he is specially qualified to speak.

Railway Companies' Allotments.

THE London and South Western Railway has announced that the use of the Company's unlet land, suitable for the purpose, shall be allowed to the staff free of charge for growing potatoes this coming season, and, further, that the Directors are prepared, if necessary, to advance the money to enable each grower on new or hitherto uncultivated land to purchase up to ½ cwt. of seed potatoes, or to obtain the seed and distribute it at cost price. The response, so far, from the staff in the way of applications for plots and seed promises well for the success of the scheme, and in order that the best use may be made of land, seed, and goodwill, a Committee, composed as follows, has been formed for the purpose of helping on the work: Mr. W. Buckmaster, General Manager's Office (Chairman); Mr. F. V. Milton, Publicity Department; Mr. Forsyth, Carriage and Wagon Department, Eastleigh; Mr. Revell, stationmaster, Earlsfield; Signalmen Thomson (Clapham Junction), Saunders (Hampton Court), Bennett (Farnham), Madge (Exeter), and Shutler (Exeter); Head Porter J. Short (Hamworthy Junction), and A. C. Hayward (Andover Junction); Foreman Platelayer S. L. Greathurst (Claygate), Foreman Platelayer A. Cox (Guildford), Labourers W. Andrews (Eastleigh), S. Dunning (Ringwood), T. Kiff (Exeter), and Striker A. Gooding (Exeter).

A notice issued by Mr. Alfred Aslett, Secretary and General Manager, Furness Railway, states that the Company will consider applications from their staff and from members of the public for the use, during the present emergency, of vacant strips of land, both inside and outside the railway fences, subject to the terms of a short agreement and the payment of a nominal rent of 1s. per annum, which will include stamp duty and rates. The average size of the plots will be 300 sq. yards. Similar announcements have also been made by most other railways, in some instances the terms being slightly modified according to circumstances, and there is no need to refer in detail to all, except to mention that the general realisation of the possibilities of such measures indicates that our railways are fully alive to the needs of the situation, and are doing their part in this connection as in others.

Railway Employes and the War Loan.

IN order to assist their staff to subscribe for the loan by deductions from weekly wages or fortnightly salaries, the London and North Western Railway announced that they would be prepared to purchase the required amount of stock and pay the full price at once in order to secure for the staff the maximum amount of interest. The Company will pay over to the subscriber the full interest received from the Government on June 1st next, and subsequently, without any deduction for interest on the money advanced for the immediate purchase of the stock. To secure this the employé was required to authorise the Company to deduct from his wages 2s. per week (4s. per fortnight from salaries) in respect of each £5 stock taken up, and so on for any larger amount of stock applied for.

In a circular letter from the General Manager to the staff of the Midland Railway, it was announced that the Board, encouraged by the result of the appeal to subscribe to the four-and-a-half per cent. National War Loan issued in July, 1915, had decided to afford similar facilities to those who desired to subscribe to the new war loan. Such an amount of the new war loan would therefore be applied for as would be sufficient to meet the requirements of the staff whose contributions for purchase may be spread over a period of two years to February 28th, 1919, on similar terms and conditions, except as to the rate of interest, as obtained in the case of the subscriptions to the four-and-a-half per cent. National War Loan of 1915. Facilities were also given to depositors in the Company's Savings Bank for money standing to their credit to be applied to the purchase of the new stock up to £200.

Similar methods were adopted by various other railways. In the case of the Furness Railway the Directors have authorised arrangements by which payment for the stock could be made at the request of the subscribers by deductions from the monthly or weekly pay bills up to a limit of £200. The Company will pay over to the subscriber the full interest received from the Government on June 1st next, and subsequently without any deduction for interest on the money which the Company will advance for the immediate purchase of the stock. To secure this subscribers had to authorise the Company to deduct from their wages 2s. per week (8s. per month from salaries) in respect of each £5 stock taken up. When the payments have been completed, certificates for the amount of stock subscribed for will be issued to the applicant.

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"Disc" Season Tickets on the London and South Western Railway.

In order to overcome the inconvenience of having to produce season tickets from pocket-books, purses, and handbags, etc., Sir Herbert Walker, General Manager, London and South

SPECIMEN "DISC" SEASON TICKET: LONDON AND SOUTH WESTERN RAILWAY.

Western Railway, has introduced a disc type of holder in place of the ordinary descriptions of season tickets. The ticket itself is circular, about the size of half-a-crown, and is placed in a narrow metal case, circular in shape, and having a circular opening on one side, and an approximately rectangular opening on the back, both being covered by thin sheets of transparent material, mica having been used so far.

The front of the ticket shows through the circular opening. At the head is an indication of class—cards of suitable colours are also being employed to show this differentiation at a glance—and below the names of the stations between which the ticket is available, with the date of expiry—in numerals, thus, 26.6.17—at the base. On the back is the holder's name, and a reference to the Company's regulations. The circular opening on the front is framed by the name of the railway imprinted on enamel; while the back is stamped "The property of the London and South Western Railway," with the name and office of the General Manager. In practice these holders are issued with the card sealed in the slit provided round about three-parts of the rim to allow of insertion, and on expiry would be handed back intact, new holders being issued, the old ones being then emptied and refilled as fresh ones.

At the top is a perforation in which a link is fitted, and this can be fixed to the watch chain, or placed on a short chain or safety-pin attachment for use as convenient to the holder. An interesting photograph is reproduced, prepared to show various ways of using these tickets. One of the ladies has the ticket fitted in a wristlet holder. The other lady has the holder chained to her handbag. The three gentlemen are all well known members of the staff. Mr. W. Buckmaster, Chief Clerk to the General Manager, has a ticket attached to his watch chain. Mr. F. V. Milton, behind, chief of the publicity department, has a holder fastened to the lapel of his coat. Mr. J. Harrad, principal assistant in the publicity department, adopts the less obtrusive method of hiding the holder underneath the coat lapel, whence it can easily be revealed for inspection when necessary. This photograph thus shows five methods of using the new holders, while others will suggest themselves according to personal views and conditions.

Photo] [*Topical.*

METHODS OF USING "DISC" SEASON TICKETS: LONDON AND SOUTH WESTERN RAILWAY.

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The Value of Railway Publicity.

At the ninth Operating Department Efficiency Meeting of the "Underground" system, Mr. H. E. Blain, the Operating Manager, presiding, a paper on "The Popularising of Passenger Transportation" was read by Mr. S. T. Trigg, Chief Inspector of the Tube Railways, who divided his subject into two main parts (*a*) Attracting the Passenger, and (*b*) Getting and Keeping the Passenger. The importance of the various forms of advertising media, posters, press, house to house distribution, etc., was pointed out, and an interesting collection of posters was exhibited, including some of the most attractive issued by the various Railway Companies, and incidentally showing the extent to which the artistic side of publicity has been studied. As an instance of the value of special publicity campaigns, the recent scheme of the Great Eastern Railway encouraging the poultry and egg trade in the provinces was referred to, and the "Safety First" and other campaigns were commended. The necessity for publicity for country routes, seaside excursions, etc., was emphasised and the American notion of amusement parks discussed. Slides were shown showing the great improvement of recent years in station sign schemes, and in the display of station advertisements.

In the second part of the paper, the importance of frequent services, regular and punctual running, prompt attention at booking offices, lifts and ticket barriers on the railways, and on the front and back of trams and 'buses, was pointed out, and special emphasis laid on the display of tact and courtesy on the part of the staff. In the latter connection, various systems of staff reward and punishment were referred to. Brightness, neatness and reasonable ornamentation of stations added effect, and the changes of the past few years in this respect were also shown by slides. Points in connection with rolling stock were discussed as well as the central control system in connection with the regulation of headways, etc., this system having now been successfully adopted in connection with both the Underground Railways and the 'Bus Company. The final portion of the paper dealt with adjuncts to travel, in the shape of lifts, escalators, etc., and referred also to fare systems. A discussion on the paper was opened by Mr. E. S. Welton, Indoor Assistant of the General Superintendent (London General Omnibus Company) and was continued by a large number of speakers, several specially interesting and valuable suggestions being made.

Engine Working on the Caledonian Railway.

Certain statements in Mr. Francis' article in the January number on Scottish Locomotives, and the reply to E. J. Moir in "The Why and the Wherefore" section last month have caused some heartburnings among several readers. The general remark which initiated the controversy, to the effect that on the Caledonian Railway it has been a standard practice to keep certain engines fairly regularly to particular trains, is not affected. It is only as to which engines have been concerned that queries have arisen, though the comments advanced in connection do not entirely agree. Mr. Fred. A. Neish, of Dundee, explains that he has never yet heard of a 6 ft. 6 in. 4-6-0 on the 10 a.m. *ex*-Buchanan Street, the engine always being of the 5 ft. 9 in. class or a 4-4-0. He specifies Nos. 908 and 913, non-superheater, and Nos. 179 and 184, with occasionally No. 185, all superheated. For a period Nos. 184 and 185 worked the 10 a.m. and 5 p.m. from Buchanan Street to Perth alternate weeks. Mr. Neish also mentions the working of the 10 a.m., prior to the alterations of January 1st, by one of the 6 ft. 4-6-0 engines taken over from the Highland Railway, usually Nos. 942 or 943, these engines working the two trains specified in turn. Continuing, Mr. Neish states that No. 908 had the 10 a.m. for some years (drivers Andrew Brown, William Wishart and George Newlands). Then No. 913 took over the duty for a year or two, but after that the principle of the "same engine daily" was not so closely adhered to. He also mentions that Driver Newlands on No. 942 worked regularly for some time prior to January 1st this year.

In the case of the 2 p.m. from Buchanan Street the engines which have been regularly employed are, first, No. 50 *Sir James Thompson* and No. 906, both of the 6 ft. 6 in. class and now superheated. Until January 1st, explains Mr. Neish, a Perth engine leaving there at 7.15 a.m. usually worked the 10 a.m. *ex*-Buchanan Street to Perth (not to Aberdeen), completing the day's work with a trip to Dundee and back.

Another esteemed reader who writes in reference to this matter is Capt. R. A. Chrystal. He mentions that the clearly defined duties a few years ago were: Glasgow and Carlisle, Nos. 49, 50, 903 and 907; Perth and Aberdeen, Nos. 904 and 905; and Buchanan Street, Perth and Dundee, Nos. 906 and 908, all 6 ft. 6 in. class except the last mentioned. These last two engines were for a long period the only 4-6-0's on the Glasgow-Perth section, one working the 10 a.m. and the other the 2 p.m., changing duties on these two turns. It will thus be seen that the two correspondents do not agree in every detail, though the differences are, no doubt, merely those of the period under review, which explanation also applies to Mr. Moir's remarks quoted last month.

Caledonian Railway 4-6-0's.

Capt. Chrystal also queries the total of 46 engines of the 4-6-0 type, though we may point out that this was the total officially stated for the year ending December 31st, 1915, the latest date available. He accounts for these engines thus:—

	Total.
6 ft. 6 in. Class, Nos. 49, 50, 903–7	7
5 ft. 9 in. ,, Nos. 908–917	10
5 ft. 9 in. ,, Nos. 179–188	10
5 ft. "Oban" Class, Nos. 51–59	9
5 ft. goods ,, Nos. 918–922	5
6 ft. Class (from H.R.), Nos. 941–7 (?) ..	6

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This makes a total of 47, so that there is either one engine unaccounted for, or one too many is stated above. Possibly one of our Scottish readers can settle the matter definitely.

Exception is taken to the practice of referring to the 5 ft. 9 in. classes as "mixed traffic," being designed and mainly used for the heavy coast trains, some of which in normal times would load up to = 18 or = 20, and including 12-wheeled coaches. This correction we willingly accept, especially as the term "mixed traffic" is usually adopted for convenient differentiation from the 6 ft. 6 in. class, than because the engines do much goods working. However, as the Highland 4-6-0's, also with 5 ft. 9 in. coupled wheels, are never referred to in this way, Capt. Chrystal's criticism is fully justified.

Locomotives on the Caledonian Railway.

MR. GERALD H. GUTHRIE, of Leith, writes: "With reference to the article by Mr. Francis on 'Locomotives on Scottish Railways,' there are two distinct classes of 5 ft. 4-6-0's, namely, the 'Oban' engines built in 1902 and 1905, Nos. 51-59, and the express goods engines Nos. 918-922 built in 1906. I have noticed the latter engines also working passenger trains on the Oban line during the summer months. It is hardly correct to state that the 5 ft. 9 in. class are mixed traffic locomotives, as the 'Sir James King' class, 908-917, were originally intended for working the heavy 'Coast expresses.' They also work many of the important trains from Glasgow to the North. The newer engines of this type—179-183—have also taken their share of express work. During the summer of 1914 No. 179 frequently worked the 10 a.m. 'Grampian Corridor Express' from Glasgow. Why is it that 917 and 179-183 are fitted with side window cabs, while this has not been done with any other type of engine on the Caledonian?"

In regard to this query we understand that the closed cab was fitted more or less as an experiment, but that it was not considered desirable or necessary to extend the practice. Mr. Guthrie also asks: "What are the numbers of the remaining 2-4-0 and 0-4-2 tender engines, and which ones have inside cylinders? All the engines I have seen of both classes have outside cylinders, but I have a photo of an 0-4-2—No. 1323—which has inside cylinders. I have heard that there was a type of engine similar to the 2-4-0's, but with leading bogie and outside cylinders. Can you give me any particulars about them? I do not refer to the 'Old Oban Bogies' Nos. 179-188. Also I should like to hear more about the 0-4-2 tank engines mentioned, and where did the 2-4-2 tanks work after they were replaced by the 'Oban Bogies'?"

He continues: "Mr. Niven remarks on the Drummond 5 ft. 9 in. bogies Nos. 81, 82, 85, 86 and 116 stationed at Gourock. Other engines of this class are Nos. 80, 114, 115 and 195-198. Nos. 196 and 197 regularly worked some of the lighter trains between Edinburgh and Carstairs until quite recently, also a few of the North trains. No. 81 is now employed on shunting duties at Edinburgh. At one time, I believe, they were tried on the Oban line. I have often seen No. 115 working near Dunblane and Callander. To what class did the outside cylinder rebuilds 473, 479 and 380 belong, and are they still in existence?"

War Time Traffic Working.

NUMEROUS noteworthy features have been set forth under this heading, but in view of the fact that the boundaries of railway ownership and traffic working are now recognised hardly at all, it is necessary to bring consideration of this phase to an end for the time being. In so doing, however, we may summarise a few items from correspondence still available. Mr. A. Dean, of Bedford, mentions a Great Eastern 0-6-0 goods engine on a train mainly composed of Great Western wagons, with a London and South Western brake van, and travelling on the North and South Western Junction Railway near Willesden. Mr. O'Donoghue, of Grantham, refers to a North Eastern Railway 4-6-0 engine as far south as Peterborough, and a Great Eastern 0-6-0 engine on a London and North Western goods train on the Peterborough-Rugby branch. Mr. L. C. King-Wilkinson writes concerning combinations he has seen passing through Winchester: (1) train of Glasgow and South Western corridor stock, Great Western 4-4-0 engine; (2) train of Great Northern vehicles with Great Northern 0-6-0 engine; (3) train of South Eastern and Chatham coaches, with 4-4-0 engine of the same line; (4) and train of London and North Western coaches hauled by Great Western locomotive.

Mr. G. H. Cameron refers to train of Caledonian coaches at St. Mary Cray, South Eastern and Chatham Railway; also a train of Great Northern and Great Central vehicles, in both cases with South Eastern and Chatham Railway locomotives.

Mr. Ernest L. Diamond, of Colwyn Bay, mentions having seen a heavy goods train on the Barry Railway worked by three 0-6-2 tank engines of the same class. Mr. G. H. Cannon refers to a Red Cross train observed on the South Eastern and Chatham Railway near St. John's, worked by two Great Eastern Railway 2-4-2 tank engines Nos. 216 and 217. Presumably these engines took over the train at Hither Green and were working it through to Liverpool Street from there *viâ* the East London Railway. Mr. J. P. Bardsley writes from Marlborough College referring to having seen a Great Eastern Railway train at Preston, also several complete North Staffordshire and Midland (locomotive also) trains there. He also mentions an unusual locomotive combination, a London and North Western Railway coal train worked by a 0-8-0 engine and piloted by a "George the Fifth" 4-4-0 engine. Mr. E. J. Dorby, serving with the Colours, describes a run some years ago on a football special from Portsmouth to Birmingham, taken to Andover by London and South Western engine No. 290 (Mr. Drummond's early 4-4-0 express class), from thence to Cheltenham by

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two Midland and South Western Junction Railway locomotives, where two Midland 2–4–0 engines took the train on, these being assisted up the Lickey incline by two 0–6–0 tank engines in rear, making four engines on this section.

Mr. W. Smith refers to a line of Caledonian Railway engines at Perth, Nos. 590, 591, 593, 594, 691 and 692, all 0–6–0 and Westinghouse fitted, all headed north, and in progressive numerical order, though in position for going out. He has also noted the 1.10 p.m. (now 12 noon) Aberdeen–London express arrive at Perth headed by 4–4–0 engines Nos. 928 and 929.

Double-Heading Curiosities.

Mr. L. B. Hewitt, of Bath, writes :—"Many instances of 'double-heading' of trains, or the close proximity from other reasons, of locomotives bearing consecutive numbers have been furnished by readers of the Railway Magazine recently and make interesting contributions. It has occurred to me that another branch of the same topic—though obviously more restricted—might be pursued with advantage. I refer to apposite—or otherwise—combinations caused by the 'double-heading' of trains by two named engines. Two causes—the great increase in the power of the modern locomotive, and the disuse in at least one notable instance of the practice of naming locomotives, naturally restrict the field for observation. The most recent instance of appropriate 'double-heading' which I can recall was on the Great Western Railway, when two engines of the 'City' type bearing the names of cities only a dozen miles apart—*City of Bath* and *City of Bristol*—were attached to the same train."

Railway Racing.

In the days of the stage-coach, complaints were frequent of the racing in which the drivers of mail vehicles indulged to the danger of their passengers. A century ago inquests into the death of passengers who had lost their lives in this way were fairly frequent. Evidently the public suspected engine-drivers of early days in indulging in a similar practice. As recently as January 31st, 1867—half a century ago—the *Bath Chronicle* records that Mr. Charles Dickens had written a letter to the *Times* complaining very strongly of the reckless driving of the trains between Leicester and Bedford. Two years earlier—on June 9th, 1865—the famous novelist had been a passenger in the train which was wrecked at Staplehurst, on the South Eastern Railway, when eight coaches fell into the bed of the river, and ten passengers lost their lives. Doubtless this experience accounted for his subsequent caution in matters relating to railways.

New 0-6-4 Tank Engine: North Staffordshire Railway.

In a preliminary reference by Mr. Allen last month to the first of a new series of 0–6–4 tank engines with 5 ft. 6 in. coupled wheels, the number 53 was quoted. Mr. J. A. Hookham, Locomotive Engineer, North Staffordshire Railway, points out that No. 53 is of the preceding class with 5 ft. wheels, those of the largest class at present in service being Nos. 114, 116 and 117. An illustration and particulars of these new engines will appear in due course, but meanwhile we may mention that, with the exception of the larger coupled wheels, they are virtually identical with the previous class. They are known as Class F and were put in hand by the late Mr. J. A. Adams, and had it not been for the war, several would have been in traffic during his lifetime.

A reader from Stoke-on-Trent, Mr. J. E. Robinson, states that the numbers of the 5 ft. 0–6–4 class are 4, 5, 30, 31, 53, 76 and 174, with one other he has no note of. There will be a fourth of the 5 ft. 6 in. class. He also writes: "A peculiarity of the new locomotives is that they have round buffers in the front, and oval ones at the back, the latter presumably to compensate for the tendency of the engine to go straight when traversing sharp curves, due to the flexibility of the bogie, and thus possibly fouling the buffers of rolling stock coupled up in the rear. Of course, this is only a theory, and must be treated for what it is worth."

Cosmopolitan Railway Centres.

Arising out of notes on "War Time Traffic Working," an old reader now resident in Taunton, Mass., U.S.A., in the course of a long and interesting letter, mentions some of his recollections of 20 years spent at Helsby. Thus he recalls that at special periods, such as August Bank Holiday and Chester Race Week, it used to be possible to see at Helsby locomotives of the following railways :—

(1) *Great Central.* Four 0–6–0 goods engines were stationed at Helsby (Cheshire Lines Committee), generally taking in goods trains from Birkenhead, brought to Helsby West Cheshire Junction by Great Western engines.
(2) *Great Western.* On Chester–Manchester trains and on the Hooton branch.
(3) *London and North Western.* On similar duties to the Great Western.
(4) *Midland.* Occasionally on Cheshire Lines Committee goods trains.
(5) *Lancashire and Yorkshire.* On Chester race trains and North Wales excursions.
(6) *North Eastern.* On North Wales excursions, troop trains, etc.

Mr. Taylor also mentions that with the aid of a telescope, looking across the Mersey to the Lancashire side, it was often possible to see again trains which had passed Helsby about half an hour previously, but travelling in the opposite direction. He also observed Great Northern and North Staffordshire through goods trains on the Cheshire Lines main line from the Manchester district to Liverpool.

American Railways Borrow Locomotives.

Mr. Taylor further remarks that in the New England district, where he now resides, war activities of local industries have so stimulated the New York New Haven and Hartford Railroad

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that they also have had to borrow locomotives, and he has noted on goods trains the following:

Bangor and Aroostook Railway. 4–6–0 engines, 150 miles from their own lines.

Boston and Albany Railway. 2–8–0 engines, nearest point, 50 miles.

Pennsylvania Railroad. 4–6–0 engines, 250 miles from their nearest lines.

Judging from his letter, Mr. Taylor is not favourably impressed by some features of railway working locally. He states that Taunton is the junction of six radiating lines belonging to the New York New Haven and Hartford Railroad, Old Colony Division, but there is no proper semaphore system of signalling in the whole of this large division, signalling being carried on by what we would call "ground frames" with men in little wooden huts, who "wave their arms and flags in sundry mysterious ways to direct traffic. At some junction points they still hoist *a barrel on a tall pole* to show if the line is clear or not. When a train is stopped a red flag is spiked between the rails some distance back, to this day."

He also asks: "What would British railway managers think of methods which caused, the other day, a train to arrive at Taunton minus the smoking car, which had been forgotten (!!) at the terminal; the passengers sent a deputation to the stationmaster, who secured the only spare coach in Taunton yard and attached it for the remainder of the journey to Newport, R.I."

The Baker Locomotive Valve Gear.

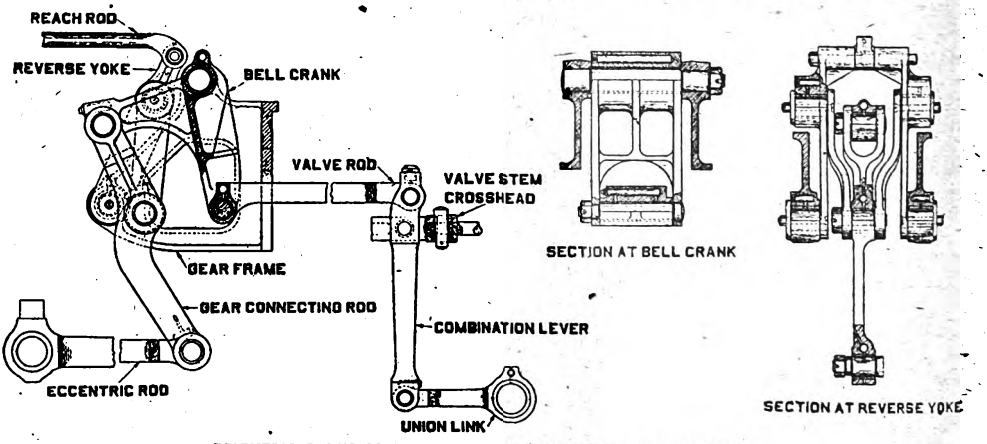
Mr. Niven writes in reference to this gear, which is now finding considerable favour in the United States, and as it possesses considerable interest, it is thought that particulars of it will be appreciated by many of our readers.

This gear is of outside type, and it is compounded of two motions, the crank affixed to the main crank pin giving the principal motion to the valve, while that derived from the crosshead and combination lever moves the valve to a distance equal to the lead plus the lap.

The primary object of this gear is to provide a constant lead opening, to provide a full and rapid uncovering of the steam port at a time when a generous supply of steam is required, and to close the port opening promptly and effectively at the desired moment.

The lead and the lap distance is produced by the motion of the locomotive crosshead, reduced by the motion of the combination lever which pivots on a point above the valve stem for inside admission, and below for outside admission, and placed at a particular distance from the valve stem crosshead. This distance is arranged so as to always give a motion equal to the lap, plus the lead. The union link, combination lever and crosshead of the engine gives the valve its lap and lead motion, and the eccentric crank, with its connections, supplies the valve gear its reversing movement and its variable cut-off motion.

The position of the eccentric pin determines the motion of the valve, so that it will give port opening at the proper end of the cylinder and at the right time, and also that it will close promptly. These two motions from the main pin eccentric and the locomotive crosshead are separate and distinct, being combined by the valve gear.



ESSENTIAL PARTS OF THE BAKER VALVE GEAR FOR LOCOMOTIVES.

Exhaust Cocks on Locomotives

Mr. Ahrons recently alluded to "exhaust cocks" on the North Eastern Fletcher 2–4–0 engines; Mr. Niven writes in reference to the arrangement used on the 2–4–0 Smellie engines, Glasgow and South Western Railway. "On these engines there was a pipe of perhaps ½ in. bore curving in front of the leading wheels. This was led down so as to lubricate the flange and rail so as to avoid undue friction going round curves. I presume, however, it was not a great benefit in practice, as very often the pipes were choked with cylinder residue. . . . Mr. Ahrons mentions how quiet the North Eastern engines ran; so did the Smellie engines. These 2–4–0 locomotives could run a train of 14½ vehicles,

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when the grade was moderate, with a light cut-off and sometimes a partially closed throttle. They were hot fire throwers. In fact, our early engineers had a gift in producing free-running engines, also realising moderate coal consumption, and seldom exceeding 30 lbs. per mile in averages."

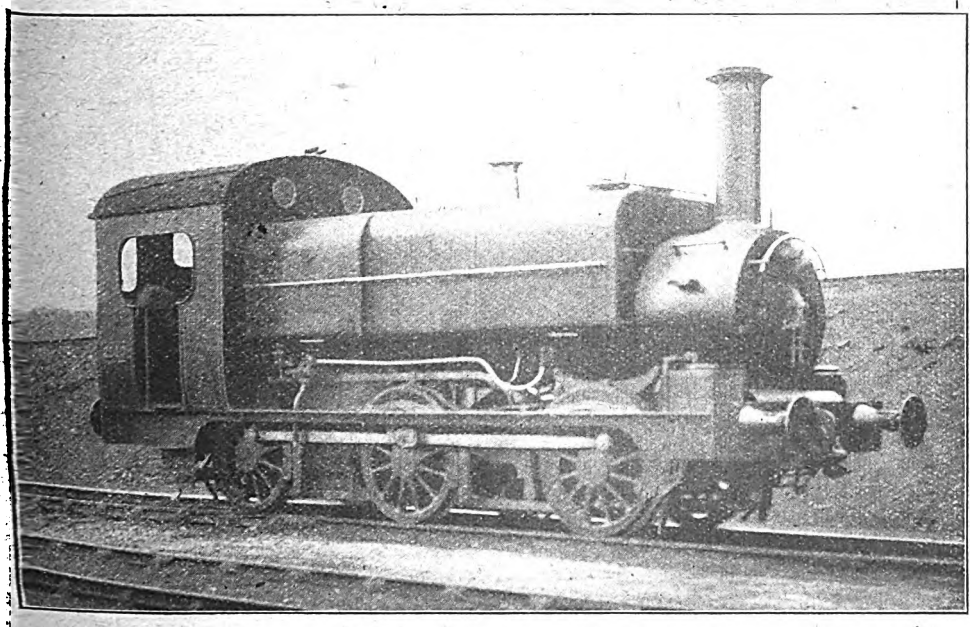
The Uganda Railway and East African Warfare.

In his report for 1915–16, the General Manager of the Uganda Railway gives details of the persistent efforts of the Germans to damage the line and interrupt traffic, and of the methods adopted to foil them. The last attack occurred on May 16th last, when a goods train was blown up and derailed. In all fifty-five attempts were made during the year. Preventive measures adopted included the removal of ballast between the sleepers so that a mine could not be fixed without being exposed, oil trails on the ballasting on each side of the rails, and whitewashing the ballast and formation to show if it had been disturbed. Maintenance gangs were strengthened, the line was patrolled throughout the danger zone, and guards were placed by the military at all bridges and culverts throughout the entire length of the railway.

An armoured vehicle was run with each mail train, and guard trucks run in front of the engine. The armoured car was a 10-ton high-sided truck lined with ½ in. steel plate, with a board roof supported by iron uprights, and occupied by a guard of soldiers to repel any attack that might take place upon the train which they were guarding. The guard truck was, at first, usually a 20-ton bogie wagon loaded with sand, and was for the purpose of exploding the bomb before the locomotive reached it. The Germans, however, altered the construction of their bombs, so that they worked by a ratchet that required a certain number of axle loads over it before the striker struck the detonator. It then became necessary to use two bogie vehicles in advance. When it was decided that every European in the Government service should be encouraged to join the local military forces, the difficulty (says the report) was not the enlistment of men, but the convincing of the railway staff that by continuing their ordinary duties they were rendering as important a service as if they were in the firing line. Of a total staff of 236, 86 were released for military service.

Old London, Chatham and Dover Engines.

In the course of a very appreciative letter from a very old reader of the Railway Magazine arising out of Mr. Hopwood's recent article on the London, Chatham and Dover Railway, Mr. David Tansar suggests that he saw Nos. 1 and 2 at work only a year or so ago. This cannot, however, be correct, as the engines were broken up at least seven or eight years since, if not further back still. We recollect seeing No. 1 in the breaking-up yard at Longbridge, already dismantled. Our correspondent mentions that as a boy he lived not far from Longbridge Works, and recalls how he used to collect the names and numbers of the engines of the period.



Photo] [*F. Roberts.*

GREAT WESTERN RAILWAY.

0-6-0 Saddle tank engine No. 2140, as used for working motor trains in the Plymouth district.

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Mr. Calthrop's Government Appointment.

To turn to the railway service for capable men to control national affairs in times of great stress and emergency is becoming a habit with the British Government, and while the choice is fully justified it is none the less a compliment to all employed in the great industry as well as an appreciation of the business abilities of the railway officers personally concerned. Recently it was officially announced that it has been decided that the Board of Trade should take possession of all the coal mines in the United Kingdom for the period of the war in addition to those in South Wales, which have already been taken over under the Defence of the Realm Act. The President of the Board of Trade has decided to set up a new department, which will control the coal mines and will also exercise the other powers and duties of the Board of Trade with regard to coal.

This announcement was supplemented by the intimation that the London and North Western Railway had kindly placed the services of the General Manager, Mr. Guy Calthrop, at the disposal of the President of the Board of Trade to take charge of the new department. Mr. Calthrop's official designation will be Controller of Coal Mines, and his office will be No. 8, Richmond Terrace, Whitehall, S.W. By arrangement with the Home Secretary, Sir Richard Redmayne, K.C.B. (his Majesty's Chief Inspector of Mines), will assist the Controller. The department will also be assisted by an Advisory Committee, consisting of persons selected to represent coalowners and coalminers.

Born at Uppingham, Mr. Guy Calthrop began his railway career in 1886, in the traffic department of the London and North Western Railway, and steadily worked his way upwards till in 1901 he became assistant to Sir Frederick Harrison, the then General Manager. In the following year he left the North Western, and accepted the position of General Superintendent of the Caledonian Railway, succeeding six years later to the post of General Manager. In 1910 he left England to become General Manager of the Buenos Ayres and Pacific Railway. In February, 1914, Sir Frank Ree, the General Manager of the North Western, died, and Mr. Guy Calthrop, then aged 41, was appointed to fill the vacancy.

Metropolitan Railway: Voluntary War Service Corps.

EARLY in 1916 a Voluntary War Service Corps was formed in connection with this railway, and at a recent meeting of the various sections, at which 500 were present, Mr. R. H. Selbie, the General Manager presiding, wonderful work was reported of the progress made.

Mr. Selbie said how gratifying it was to know that the staff of the Metropolitan Railway, who were either too old for the Forces or could not be spared, had volunteered in such large numbers for the various sections of the work.

As reported by the Munitions Section Secretary, upwards of half a million shells have been dealt with, and an official communication from the Minister of Munitions has been received commending the work of the Munitions Section and marked his appreciation of its efforts.

The Red Cross detachment has worked at numbers of hospitals and has helped the Police in air raids.

Upwards of 22 concerts to wounded soldiers in the hospitals have been given by the Entertainment Section.

The Naval and Military Garden Supply Section has cultivated upwards of 2½ acres at Wembley Park and forwarded approximately 100 hampers and 9 sacks of vegetables to various hospitals.

The Rifle Club Section have had good practice and out of the 86 members, 14 have lately joined the Colours.

At least 115 attendances at various hospitals have been made by the Women's Red Cross Section, and most of the students have secured First Aid Certificates.

The Sewing Class for soldiers' and sailors' garments has been busy, and the provision for sailors' and soldiers' free buffets has been well looked after.

In addition to the various sections of work of the Voluntary War Service Corps, a War Savings Association has been formed and up to the present time there are 1,100 members and more than 4,000 certificates have been bought.

At Wembley Park in September last the Sports Section of the Corps had a meeting and made a profit of over £101, out of which 531 pipes were sent out to the Front to employees of the "Met." serving with the Forces, and a certain portion of the amount was also allocated to forwarding parcels to some members of the staff who are now prisoners of war in Germany.

Altogether the meeting was a most successful one and reflected great credit on the members of the Metropolitan Railway staff, who for several reasons are not able to take a more active share in the War.

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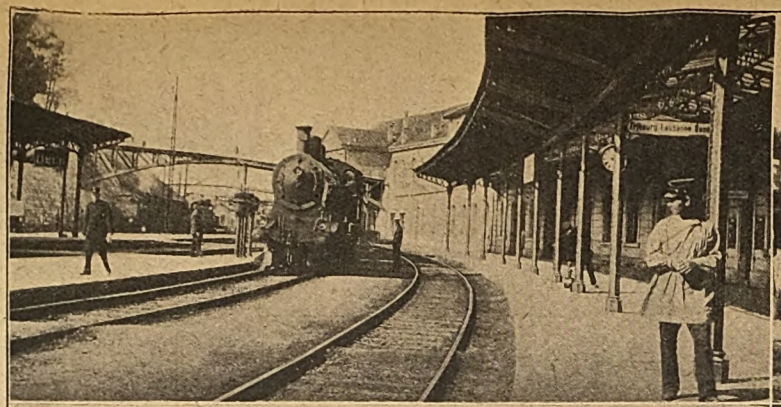
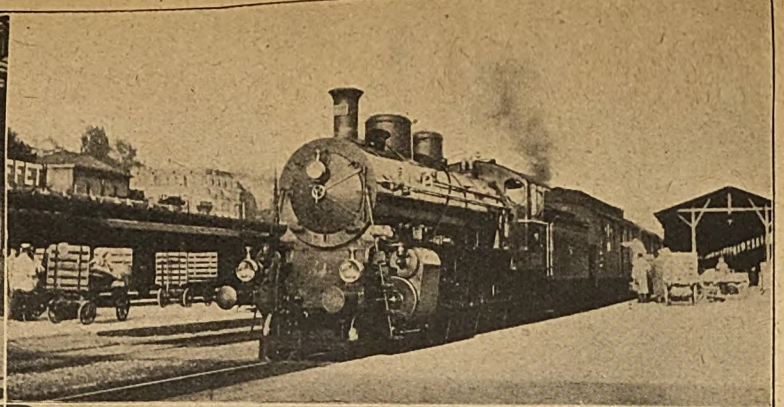
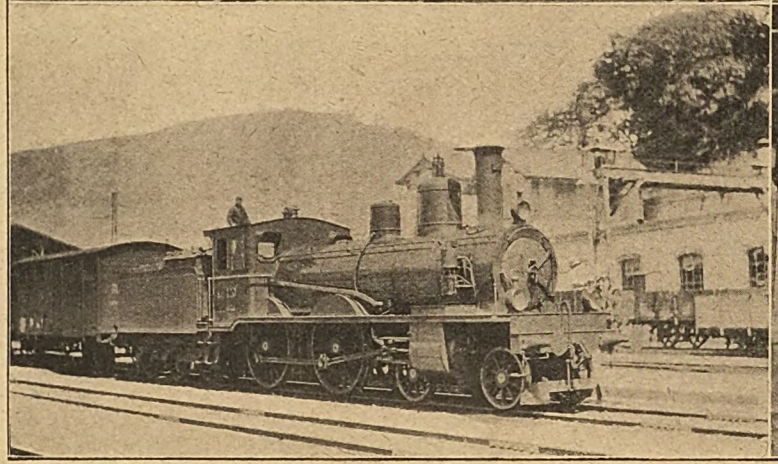
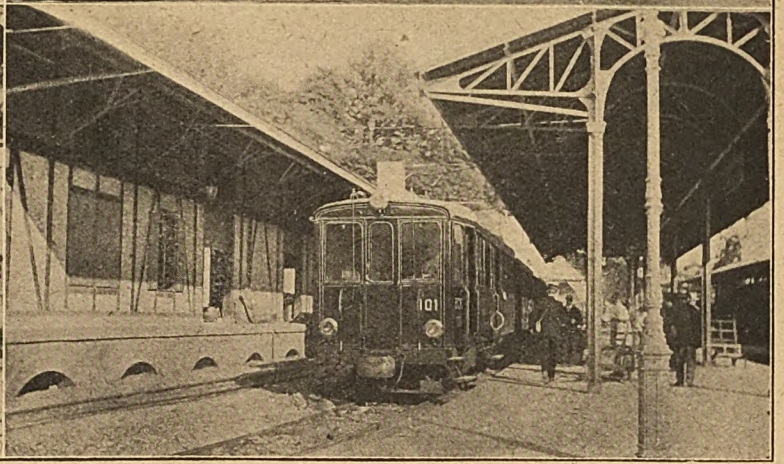
SCENES ON SWISS RAILWAYS.

From Photographs by Mr. E. A. Gurney-Smith.









BERNE STATION SWISS STATE RAILWAYS.
JURA-SIMPLON 4-4-0 LOCOMOTIVE AT VEVEY.

BERNE-GENEVA EXPRESS AT LAUSANNE.
CHEMIN DE FER VEVEYSANS (ELECTRIC) AT VEVEY.

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WHAT THE RAILWAYS ARE DOING

THE East London Railway carried last year 9,358,000 passengers, against 8,519,880 in 1915. Units and members of H.M. Forces travelling on duty and on leave during the period of the war are not included in these figures. At the previously ascertained average rate of 1.27d. for each passenger the traffic from this source should now yield over £49,500 per annum. Owing to the position of the Company as affected by conditions formulated under Government control of railways, it appears that only a portion of the interest accruing on electrification capital will be recoverable pursuant to the regulations applicable to controlled companies generally. The report of the Directors states that the Government having benefited by the great increase in passenger traffic, are being approached with a view to this Company's case being specially dealt with—*i.e.*, by recouping them the amount due and becoming due in respect of the contingent liability for interest on capital expenditure on the electrification of the railway. The general goods traffic, including large consignments on account of the Government, has been heavy.

* * *

FOUR Committees of the London "Safety First" Council—"Street Dangers," "Publicity," "Drivers' Educational," and "General Purposes"—have now been constituted, and are hard at work upon the various problems that have been referred to them. The Council has received a large number of suggestions respecting its present work and future development. A "Safety First" League, with a "Safety First" button, will probably be constituted, and the extension of the movement to fire, health, and sanitation subjects is to be expected, whilst inquiries have been made from the provinces with a view to the formation of branches in the large cities and towns. At the beginning of February the Publicity Committee offered a prize of £5 for the best couplet descriptive of the Council's objects. "Safety First" is already a popular slogan, and the public were invited to co-operate in the invention of a catchy couplet which can be utilised in connection with a variety of advertising projects under consideration. Since the first meeting of the Council, a number of additional local authorities and transport companies and firms have appointed representatives, and the Council now consists of more than a hundred members.

* * *

DURING the night of Friday, January 26th, the Chester-Holyhead line, London and North Western Railway, was blocked for through traffic by a fall of rock near Penmambach Tunnel, between Penmaenmawr and Conway, due to the action of frost causing a movement of the hillside adjacent to the tunnel. The up Irish mail express from Holyhead was held at Bangor, and to overcome the immediate difficulty every road transport had to be maintained between Llandudno Junction on one side and Penmaenmawr on the other. The obstruction was removed, and through traffic resumed within about 10 hours.

* * *

THE continued frost at the end of January affected several sections of the Irish railways adversely. A Great Southern and Western Railway train, which left Palace East, Co. Wexford, on Friday, became lodged in a snowdrift some 4 miles from Borris, and was brought to a standstill. A breakdown train was sent from Dublin, but it was held up 2 miles off. The following day a second relief train was sent out. The storm was also severely felt on the Midland Great Western line. No trains were running westward from Castlebar towards Westport and Achill on Saturday, and snowdrifts were reported 8 ft. deep. On branches of the Great Southern and Western line trains were held up for hours.

* * *

THE Great Western Musical Society held their twenty-ninth concert on Thursday, January 11th, in the General Meeting Room at Paddington Station. The programme was of an ambitious and varied character, and comprised the concert edition of Gounod's opera "Faust," a few items consisting of ballads, male voice quartettes and part songs, the orchestral suite "An Evening Ramble," by A. E. Matt, and concluded with solos and choruses from the second half of Handel's "Judas Maccabeus." The orchestra and chorus were under the direction of Mr. H. A. Hughes. In the absence of Mr. Reg. Hughes, on active service, Mr. W. F. Palamountain was the accompanist.

* * *

A NOVEL announcement was recently made by the Chief Goods Manager, Great Western Railway, offering a reward to anyone who is able to trace the whereabouts of any of a number of hired railway wagons which, despite careful enquiries, cannot be discovered. The wagons might be either on or off the Great Western system, in fact it is stated that there is not the slightest clue to where they are likely to be found. The numbers of the missing wagons are—0323, 01005, 01199, 02524, 04607.

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MR. LEONARD SYDNEY SMITH,

Superintendent of Hotels and Refreshment Rooms, Great Eastern Railway.

MR. LEONARD SYDNEY SMITH, whose appointment as Superintendent of Hotels and Refreshment Rooms, Great Eastern Railway, has already been announced, knows the *metier* in every detail, as shown by his record already achieved. Mr. Sydney Smith's hotel experience began with nine years at the Hotel Metropole and Whitehall Rooms. There he obtained an intimate knowledge of all departments, which has since stood him in good stead both in England and France. Afterwards he was at the Ritz, London, for five years, working under Mr. Ritz himself and Mr. Ellès. Mr. Sydney Smith has also managed to put in considerable Continental experience, both at the Hotel Athenée, in Paris, and the Hotel de Londres. At the outbreak of the war he was managing a hotel de luxe, the Hotel des Anglais at Le Touquet, near Boulogne, where he favourably impressed both visitors and staff by his suavity of manner, business ability, and study of his guests' comfort. The "Piccadilly," London, and the "Empire" at Bath availed themselves of Mr. Sydney Smith's services during war time until they were secured by the directors of the Great Eastern Railway. Mr. Sydney Smith's first-class Continental experience has made him practically bi-lingual, a great advantage in an English manager.

* * *

For the year 1917 the Chairman of the Traffic Officer's Committee at the Irish Railway Clearing House, Dublin, is Mr. T. Elliott, Traffic Manager, Midland Great Western Railway.

IN aid of the funds of that very deserving institution, the London and South Western Railway Servants' Orphanage at Woking, a concert is to be held at the Cannon Street Hotel, London, on Friday evening, March 30th. Mr. A. W. Szlumper, Chief Engineer, London and South Western Railway, will preside. The Hon. Secretaries for the concert are Messrs. W. J. Soper, Hambro Wharf, and R. J. Meek, Alderrgate Street office, and this should ensure, as in former years, a first-class programme and a thoroughly enjoyable evening. In regard to the Orpanhage itself, of which Mr. H. G. Warne is Secretary, it is worthy of note that the Board of Management have recently admitted three of the following children of Private Leslie Spencer, of Guildford (killed in action in France) :—Five boys aged respectively 8, 6, 5, 3 years, 5 months, and two girls (twins aged 1 year).

* * *

IN spite of the many calls upon his time, the President of the Board of Trade, the Rt. Hon. Sir Albert Stanley, M.P., has kindly accepted the presidency of the Railway Benevolent Institution for the current year, and it is hoped by the Board of Management that the usual collections, which will be made by the chief officers of the several railways for announcement at the next annual meeting, will compare very favourably with those recorded in past years.

* * *

ON February 6th the Board of Trade announced that it had been decided that the increase of 50 per cent. in railway passenger fares is not to apply to tickets issued to relatives desiring to visit wounded soldiers or sailors in hospital, and producing the hospital authority to do so. Such persons will be allowed to travel on the former terms, viz., single fare at the old rate for the double journey.

* * *

FROM Inverkeithing, Mr. W. D. M. Stephen writes :—"A few days after reading the RAILWAY MAGAZINE paragraph on 'Locomotive No. 1' I saw the North British Railway locomotive bearing that number. It is one of Mr. W. P. Reid's earlier non-superheater 4–4–2 tanks built in 1912. I also noticed that 4–4–2 locomotive No. 880 *Tweeddale* had just been re-built with the 'Robinson' superheater and enlarged cylinders 21 in. by 28 in. Of the same class, Nos. 868 and 873, *Aberdonian* and *Saint Mungo* respectively, were re-built a few years ago similar to No. 880."

* * *

MR. J. W. CLARKE, who has been appointed Station Superintendent at Commercial Road Goods Depôt, Midland Railway (London, Tilbury and Southend Section), previously occupied a responsible post at Leicester Goods station. He started his railway career at Sheffield (Wicker) in May, 1887, and for a number of years was Chief Staff Clerk at that station. He was transferred to Leicester in 1910.

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In the absence of Lord Muncaster, Mr. Frederic J. Ramsden presided at the annual general meeting of the Furness Railway held at Westminster on February 16th. Having dealt with the statement of financial accounts and the relations between the railway and the Government, Mr. Ramsden announced that further capital expenditure for the year 1917 will be £21,995, the greater part of which will be expended at Barrow Docks in providing additional accommodation in connection with oil storages and a new electric crane and pump for the graving dock.

Goods and mineral traffic over the Furness Railway during 1916 was very heavy and consequently many difficulties both in regard to engine power and wagons were experienced. The management were able to hire 277 wagons and with assistance received from the London and North Western and Midland Companies this large volume of traffic which represented 5,000 tons—the largest on record and about 1,000,000 tons in excess of 1914—had on the whole been worked in an expeditious manner.

Continuing Mr. Ramsden remarked that in addition to the two tank engines and four passenger tank engines delivered during 1916, they had ordered four new goods engines and tenders which they hoped would be delivered before the close of the present year. All these engines are for renewals.

In response to the appeal of the Chancellor of the Exchequer the Company had taken up the sum of £50,000 of the 5 per cent. War Loan (Registered Stock)—a very fair contribution on behalf of the Furness Railway. They had also subscribed a further sum of £10,000 to the 5 per cent. War Loan which will be paid over in due course to the Post Office on behalf of the staff who, they trusted, would be induced, in response to the circular which had been issued by the General Manager and forwarded to each of the employees, to take up a substantial amount of this War Loan.

With a view to effect every economy and in order to release engines and men for naval and military service they had considerably reduced passenger train service and discontinued running steam yachts on Lake Windermere. The increase of 50 per cent. in passenger fares had a considerable effect on the passenger traffic, with the result that in January, 1917, they conveyed 49,818 less passengers than in the corresponding month of 1916. With a view to utilise every available piece of land on the Railway, they have adopted the same arrangement as the London and North Western and some of the other railways, by offering to supply surplus land not immediately required for the Company's use to the employees and the public at the nominal sum of 1s. per annum for 300 square yards.

The number of Furness Railway employees who had joined the Colours was 344, many of whom had lost their lives, are missing or have been wounded.

Before concluding Mr. Ramsden expressed the great appreciation of the Directors for the work which had been carried out by Mr. Alfred Aslett, General Manager, the several heads of departments and the staff generally. The General Manager has received from the Railway Executive Committee no less than 877 Circular Letters since the commencement of the war, all of which have involved instructions to the Officers and Staff and numerous enquiries.

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Abbey Junction station, on the Carlisle and Silloth section of the North British Railway, has been closed for traffic. Caledonian Railway goods and passenger trains between Abbey Junction and Kirkbride Junction have also been discontinued.

* * *

February meeting of the Railway Club was held in the Club Room, 92, Victoria Street, S.W., under the presidency of Mr. S. W. Bartlett. Two new members were elected. Mr. H. L. Hopwood read a paper on "The Great Northern Railway West of Grantham." The writer traced its inception and growth, the density and character of its traffic, and dealt at length with the physical and engineering aspects as well as the train services. Mr. Hopwood's paper was illustrated by maps and photographs, and was much appreciated by the members, being followed by an animated discussion in which most present contributed.

* * *

General satisfaction was expressed in the railway world when it was found that in the New Year's honours list the splendid work done by the railways was acknowledged by the K.C.B., Civil Division, granted to Sir Herbert A. Walker, General Manager, London and South Western Railway, and acting chairman of the Railway Executive Committee. Another honour much appreciated in the North of England was the knighthood conferred on Mr. V. L. Raven, superintendent of the Royal Arsenal, Woolwich. His services were lent by the North Eastern Railway, of which company he is chief mechanical engineer.

* * *

As announced in their report, the directors of the London, Brighton and South Coast Railway, the seat on the Board rendered vacant by the death of Rear-Admiral the Hon. T. S. Brand has been offered to and accepted by Mr. Charles L. Morgan, M.Inst.C.E., the Engineer of the Company on his relinquishment of that post after 21 years distinguished service.

* * *

The Liverpool office of the Canadian Pacific Railway has been moved from the Royal Liver Building, Pier Head, to No. 6, Water Street. All communications for the Liverpool office should be addressed to Mr. T. McNeil, agent, Canadian Pacific Railway, 6, Water Street, Liverpool. The Royal Liver Building continues to be the office of the Canadian Pacific Ocean Services, Limited.

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A NEW station at Markham Village (between Holly Bush and Argoed on the Sirhowy branch) was opened by the London and North Western Railway on February 1st. Trains from Tredegar to Newport call there at 6.22 a.m., 8.10 a.m., 11.57 a.m., 2.24 p.m., 4.59 p.m., 7.41 p.m. (Saturdays excepted), and 8.11 p.m. (Saturdays only), respectively. Trains from Newport to Tredegar, commencing with the 7.40 a.m., call at 8.34 a.m., 10.27 a.m., 3.50 p.m., 4.52 p.m., 7.59 p.m., and 10.23 p.m. respectively.

* * *

ABOUT ninety members of the Lancashire and Yorkshire Railway Ambulance Centre who, since October, 1914, have assisted with the unloading of ambulance trains arriving at Aintree station with wounded soldiers for the hospitals in Liverpool and district, were recently entertained by the General Manager (Mr. John A. F. Aspinall) to supper at the Exchange Station Hotel, Liverpool. Mr. Aspinall presided, and was supported by Sir James and Lady Barr, Miss Aspinall, Mrs. Ernest Taylor, Miss Nixon, Mr. John Pedder, Lieut. Pedder, Mr. Healey (District Goods Superintendent, Liverpool), Mr. Shawcross (District Locomotive Superintendent, Aintree), Mr. G. H. Nutter (Secretary of the Lancashire and Yorkshire Ambulance Centre), Mr. Shaw (Stationmaster, Liverpool Exchange), and Mr. Scaife (Carriage and Wagon Department, Liverpool). After supper had been served, Mr. Aspinall presented each of the men with a briar pipe in a leather case, the latter being inscribed, "Memento of St. John Ambulance work at Aintree during the great war."

* * *

A CIRCULAR issued to the staff by Mr. S. Williamson, General Manager, Cambrian Railways, states that the premiums for the best-kept stations during 1916 have now been approved by the directors, and are as under: First premium of £3, Barmouth Junction; second premium of £2, Dovey Junction; third premiums of £1 10s., Afon Wen and Llynclys; fourth premiums of £1, Bangor-on-Dee and Glandyfi; fifth premium of £1, Pontdolgoch. The directors have decided to offer similar premiums next year, with the condition that no station can take the first and second premiums two years in succession, and the inspection will take place from time to time during the year. For signal cabins the following premiums have been awarded: First premiums of £2, Afon Wen and Dovey Junction; second premiums of £1, Newtown, Pwllheli West, Pwllheli East, Llanymynech, Llynclys Junction, and Towyn. For horses, harness, and stables the following premiums have been awarded: First prize, Newtown, Carter T. J. Probert, £2; second prize, Machynlleth, Carter E. E. Rowlands, £1 10s.; third prize, Ellesmere, Carter Thomas Jones, £1; fourth prizes, Builth Wells, Carter J. R. Thomas, £1, and Parcels Vanman D. Evans, £1.

* * *

MR. W. T. FARQUHAR sends a review he compiled for the *Forfar and Strathmore Advertiser* dealing with train services to and from Forfar since 1849. It is pointed out that communication was opened to Perth in 1848, and to Aberdeen about the same time. In the case of Aberdeen the line was only partly opened, the train service ending at Limpet Mill, 3 miles north of Stonehaven, a service of coaches working thence to Union Street, Aberdeen. This continued till 1850, when the line was opened throughout. Mr. Farquhar then reviews and discusses the train services of 1849, 1865, 1875, 1905, and 1914, the last-mentioned giving the highest level realised, that being just prior to the commencement of the war, since when there has been an inevitable retrograde tendency, leading up to the drastic withdrawals and decelerations of January, 1917.

* * *

MR. C. W. YATES, Registrar, Great Western Railway, has retired through ill-health. He entered the registration department at the early age of thirteen, and, had his health permitted, would have completed fifty years' service in that important section of railway activity in September next. He was appointed chief clerk in 1908, and registrar, vice the late Mr. A. Wyatt, in February, 1913. To succeed Mr. Yates, the directors have appointed Mr. W. Heditch, formerly chief clerk in the registration office, as registrar. Mr. Heditch joined the service as a junior clerk in the audit office in 1890. He was transferred to the secretary's office in 1892, and to the registration office in 1903. He succeeded to the position of chief clerk in 1913 on Mr. Yates' promotion to the post which he is now vacating.

* * *

AT the last quarterly meeting of the Railway Clearing House Superintendents' Conference, Mr. Henry Holmes, who recently retired from the position of Superintendent of the Line, London and South Western Railway, was presented with a testimonial from the members of the Conference, consisting of a silver rose bowl and plinth inscribed as follows: "Presented, with a service of plate, to Henry Holmes, M.V.O., by the members of the Railway Clearing House Superintendents' Conference on his retirement from the position of Superintendent of the Line to the London and South Western Railway Company—November, 1916"—together with a service of silver plate, and gold sleeve links. Mr. Arthur Watson (Lancashire and Yorkshire Railway), Chairman of the Conference, made the presentation, and referred to Mr. Holmes' long experience of traffic working, especially in connection with the transport of naval and military forces, asking him to accept the articles as a tangible memento of his association with the Conference, the members of which wished him every happiness. Mr. Holmes, in responding, said it was with great pleasure that he accepted the testimonial, which would always remind him of his pleasant associations with the Conference.

* * *

THE use of exposed conductor rails on electric railways may, in severe wintry weather, seriously upset the working of traffic in that a film of ice

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on the rail acts as an insulating medium, preventing the proper collection of current by the trains. It is very seldom that these conditions apply, but they did in the early hours of Monday, January 22nd. Many trains on the District, Metropolitan, and London and South Western Railways were unable to move, or were seriously delayed. The District, Wimbledon, Hounslow and Harrow services were thus very adversely affected, and although others were carried on and in a short time all the open-air lines got into proper working condition, many regular travellers had to find other means of conveyance, or to put up with delays which, in some instances, were rather lengthy. Tube lines were unaffected, except where they have open-air sections or terminals. The Brighton overhead system was also able to work almost without hindrance.

* * *

WEATHER conditions in the North during January were very severe, and ice and snow occasioned many difficulties on steam lines penetrating the mountainous and hilly districts. A mineral train on the section between Kirkby Stephen and Barnard Castle, North Eastern Railway, was snowbound for four days. Lines in the Peak District also suffered. Difficulties were also experienced in Ireland, the Dublin and South Eastern line near Palace East being blocked for a time.

* * *

THE thirty-third annual winter meeting of the Permanent Way Institution was held (by kind permission of the President and Council) at the Institution of Civil Engineers, Great George Street, Westminster, London, S.W., on Saturday, February 3rd, 1917. Mr. W. Cleaver, M.Inst.C.E., President, occupied the chair and gave a short address. In addition a paper was read on "Notes on Sleepers and Permanent Way Timber," by Mr. Arthur G. Pugh, A.F.P.W.I.

* * *

DIRECTORS of the Great Western Railway have granted the usual amount of £300 for prizes to stations throughout the system having the best kept gardens during the past summer. The number of competing stations was 467, a decrease of seven as compared with 1915. The amount is apportioned between 185 stations, divided in special and ordinary classes. The stations gaining special prizes of £5 are the following:—Bedwyn, Brislington, Droitwich, Hall Green, Haverfordwest, Kidlington, Longhope, Llanvihangel, Perranwell, Redbrook, Torquay, and Trevor. Lack of staff has prevented the gardens at some stations being cultivated to the same degree as formerly; and at others, station alterations to meet recent requirements have prevented the maintenance of flower culture. A high degree of excellence, however, has been obtained at many stations.

* * *

DURING last year engines of the 2-8-0T and 2-6-0 types have been put into traffic by the Great Western Railway. The 2-6-0 class (4300's) have proved most successful, having been found suitable for express passenger services below Newton Abbot, as well as for all types of goods, excursion and troop trains. Latest additions to this class are numbered from 5301. Engines of the 4-2-2, 0-6-0, 2-4-0, and 2-4-2T types have been condemned and broken up. Progress in fitting the Swindon superheater and the top-feed arrangement continues. Although a number of engines have been painted khaki, it was decided subsequently to discontinue this style of painting and to substitute old green colour above the footplate with black below, the buffer beams being painted red.

* * *

THE continuance of the war has necessarily restricted engineering operations on the Great Western Railway. There has, however, been considerable activity in executing for the Government works of national importance, and although a large number of the Company's works have been suspended and others curtailed, some progress can be recorded. Works brought to completion, or nearly so, during last year include: Provision of loops and other improvements between Court Sart and Jersey Marine; up and down loops and additional sidings between Briton Ferry and Court Sart; down goods loop between Bilston and Wednesbury; down goods loop at Hollinswood; extensive warehouse accommodation at Brentford Docks; new gates at entry to Plymouth Graving Dock; additional goods accommodation at Hockley, Cradley, Swan Village and Halesowen; goods offices at Llanelly and West Bromwich; station improvements at Exeter (St. Davids) and Tiverton Junction; additional siding accommodation at Newton Abbot, Gloucester, Newport East Usk Junction, Swansea, and Baglan Junction. The construction of the new railways which were in hand at the outbreak of the war has proceeded slowly. These railways are the Ealing to Shepherd's Bush Railway, Clydach, Pontardawe and Cwmgorse Railway, Wolverhampton to Bridgnorth Railway (Wolverhampton to Himley), and Trenance Valley Railway in Cornwall. The permanent way for the Ealing and Shepherd's Bush Railway is now completed, excluding electrification. Only slight progress can be recorded on the following widening works:—Kingswinford Branch, Paddington to Old Oak Common, and between Olton and Bordesley. Other works in hand on which some progress has been made, include the widening of the River Usk Viaduct, Newport; works at Fowey Harbour in connection with a new jetty; up and down loops between Port Talbot and Margam; up and down goods loop near Llantrisant; additional accommodation at Weston-super-Mare; and a new passenger station at Church Stretton. The erection of extensive goods warehouse accommodation at Pylle Mill, Bristol, is well in hand, and a commencement has been made on important sea protective works at Dawlish, and repairs to Box Tunnel.

* * *

THE Great Central Railway has a station called "Calvert," in Buckinghamshire, although no such place exists. The explanation of this

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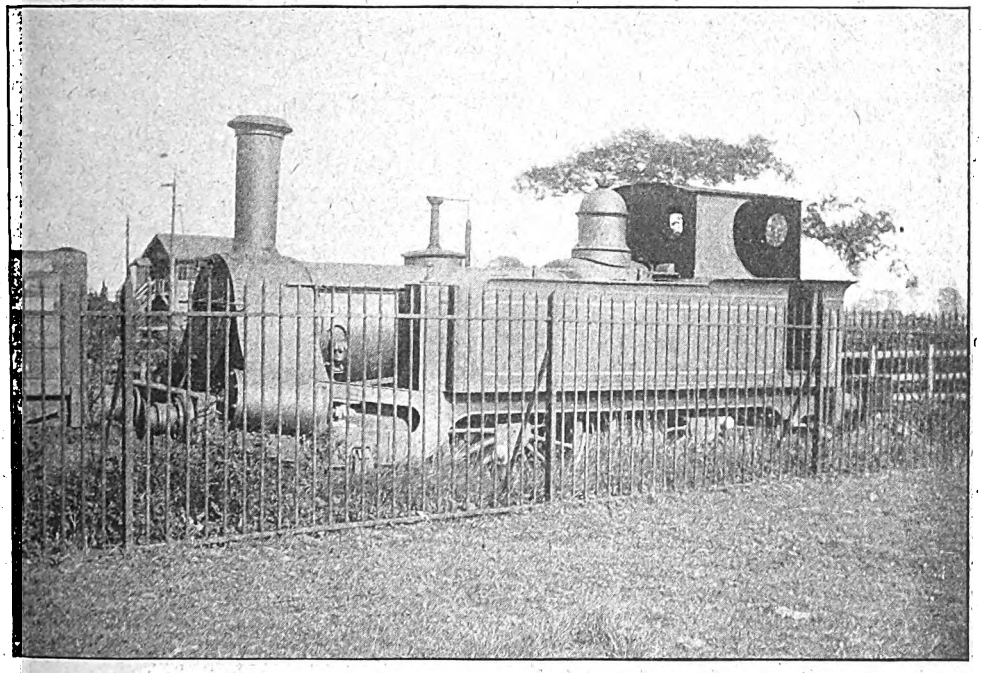
curiosity, says the *London and North Western Railway Gazette*, is that the land sold to the railway company there was the property of Sir Harry Verney, who was born a Calvert and changed his name on succeeding to the Verney estates. Many years earlier he had in the same way sold land to the London and North Western Railway, stipulating that the junction station they were proposing to build in a lonely situation should be styled "Verney Junction."

* * *

In sending a view of an old "Crewe" goods side tank (photograph taken some years ago at Alsager, North Staffordshire Railway), Mr. C. Williams, of Crewe, mentions that this engine was referred to in the October, 1916, RAILWAY



OLD "CREWE GOODS" TANK ENGINE AT WORK UNTIL A FEW YEARS AGO IN STAFFORDSHIRE.

MAGAZINE, page 292. The history of this engine is as follows:—Built at Crewe Works, November, 1852; was originally a tender engine, No. 295 *Penmaenmaur*; sold to Lancaster and Carlisle Railway, August, 1857, afterwards becoming No. 521 in London and North Western list; converted to a side tank in 1870; renumbered 1875 in 1883, and later renumbered 3097. This engine is now believed scrapped.

* * *

NEW works between Small Heath and Bordesley South, Great Western Railway, have been completed and the work at Bordesley North is proceeding. Improvements at Newport (High Street) have been carried a stage further by the provision of a direct run from the up line to the back platform line, involving considerable alterations to the signalling and interlocking at the West and Middle boxes. Important works are well in hand at Hereford, Avonmouth, and on the Basingstoke Branch. Other new boxes were brought into use at Dawley, Blackpole, between Fernhill Heath and Droitwich, and Northey's sidings on the Sutton Harbour Branch. A new block post for the main line only was provided at South Stoke between Goring and Cholsey. Signal boxes renewed included Fordgate, Puxton, Wantage Road, Swindon Goods Yard, and Monmouth Troy. The largest locking frame renewed was at Reading West Junction, the old frame being replaced by a new pattern tappet frame of 130 levers. Other locking frames renewed were at Pandy, Pensford, Sirhowy Junction, Netherton sidings, Symonds Yat, Coleham, Wantage Road, Fordgate, Swindon (Goods Yard), and Monmouth Troy.

* * *

PROVISION of machines for placing detonators on the line immediately in front of signal boxes has been considerably extended on the Great Western Railway, between three and four hundred having been fixed during last year, bringing the total number so far provided to well over a thousand.

* * *

OF a new series of 4–6–2 superheater tank engines, London and North Western Railway, the first five have been turned out and allocated as follows:—96 (Willesden), 316 (Tebay), 809 (Preston), 878 (Crewe) and 2096 (Springs Branch). The new series of four-cylinder passenger engines ("Claughton" class) recently

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turned out at Crewe, is stationed as follows :—

No.	Name.	Station.
511	*George Macpherson*	Crewe
695	*Sir Arthur Lawley*	,,
968	*Lord Kenyon*	,,
1093	*Guy Calthrop*	,,
1345	*James Bishop*	,,
2174	*E. C. Trench*	,,
2204	*Sir Herbert Walker*	Rugby
2221	*Sir Francis Dent*	Crewe
2338	*Charles H. Dent*	Camden
2395	*J. A. F. Aspinall*	Carlisle

No. 1922 *Intrepid* ("Jubilee" class) has been converted to simple ("Renown" class), and is stationed at Crewe.

* * *

REFERRING to comments in regard to old Stirling 2-4-0 engines on the Glasgow and South Western Railway, Mr. Malcolm Niven writes :— "I note 'Dalry Reader' saw No. 62A at Dumfries, but although it may be there, I would point out that some of those 2-4-0 engines were sent to various sheds for the purpose of providing hot water for washing out the boilers of the big 4-6-0 engines. No. 78A, one of the 6 ft. 7 in. class, was at Corkerhill and used for this purpose. I do not say that No. 62A is relegated to this duty, but the moving of such engines out to coal and fill the tender tank often makes it possible to see them about the yards. No. 62A is one of the 2-4-0 engines of 1870, while No. 78A was a 2-4-0 engine of the same date, but with 6 ft. 7 in. wheels."

* * *

RUNNING mileage of the Great Western Railway has been increased approximately by 7¼ miles, the principal items making it up being : Down loop between Wednesbury and Bilston, 1 mile 42 chains ; additional lines at Westbury, 1 mile ; down goods loop at West depôt, Bristol, 70 chains ; extension of Penar Branch, 64 chains. The balance is accounted for by numerous short loops and extensions.

* * *

SIGNALLING progress on the Great Western Railway has consisted chiefly in the direction of works in connection with increased accommodation necessitated by military and munitions requirements. These, in addition to the completion of outstanding new works and necessary renewals, have accounted for 17 new signal boxes (of which three are additional signal boxes and 14 renewed or replaced), 29 locking frames and 20 new ground frames, bringing the total number of working levers to 46,254—an increase of 865. Provision of up and down loops and extensive siding accommodation at Tavistock Junction necessitated a new signal box with 56 levers. In connection with the concentration of signalling at Yeovil Town, a new signal box with 55 levers was provided, the arrangements at the same time being brought up to date and track circuits installed. This enabled the two existing signal boxes to be dispensed with.

* * *

A NEW signal box has been brought into use on the Banbury and Cheltenham line, Great Western Railway, between Bloxham and Adderbury, to control the connections with the new Ironstone sidings ; a new goods passing loop has also been provided. The new signal box divides the electric train staff section between Bloxham and Adderbury, and it has been necessary to make special arrangements for switching out. During the time the new box is switched out the through section, Bloxham to Adderbury, is worked by train tablet, all contingencies having been provided for by means of interlocking between staff, tablet, and locking frame.

* * *

COMPLETION of new works at Briton Ferry, Great Western Railway, brought into use a new signal box with 61 levers, the old structure being abolished. To provide for the increased accommodation at the Steventon end of the Didcot Ordnance Depôt, a new signal box with 46 levers has been brought into use at Milton. Additional accommodation between Brierley Hill and Kingswinford Junction necessitated, in addition to alterations at Kingswinford Junction, a new signal box at Brierley Hill, named Kingswinford Junction North, with interlocking frame of 31 levers. At the same time the signal box and level crossing at Moor Lane was abolished. In connection with the new station at Porthcawl a new frame containing 54 levers and wheel has been installed in the existing signal box. To control the new junction with the Admiralty line from Bull Point a new signal box with 13 levers has been provided at St. Budeaux East.

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AT a meeting of Irish Railway Clearing House Committee held on January 31st, 1917, Sir William J. Goulding, Bart., D.L., Chairman, Great Southern and Western Railway, was unanimously re-elected Chairman of the Committee for the year 1917.

* * *

FROM the Press Bureau of the London General Omnibus Co. we have received proofs of a series of advertisements relating to "Safety First." Some of these advertisements have already appeared in the newspapers, the others will be published in due course. They consist of adaptations of nursery rhymes to "Safety First" purposes. Some are particularly clever, and all good. One example may be quoted :

"A Frog across the road would go ;
It's not Safe, cries Rowley !
Whether the Traffic would let him or no,
With Motors, Lorries, Buses, and Taxis ;
It's not Safe, cries Rowley !
On Safety First poor Froggie was slack,
And very soon found himself laid on his back,
'Midst Motors, Lorries, Buses, and Taxis.
Serve you right, says Rowley."

* * *

DIRECTORS of the Furness Railway have taken up the sum of £50,000 in the 5 per cent. War Loan, new money.

* * *

THE Glasgow District Subway has introduced a universal penny fare over the system.

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A NEW train control system has been brought into use at Bristol, while that at Newport has been remodelled.

* * *

INSTALLATION of track circuits on the Great Western Railway, combined with electrically worked distant signals at "slipping" stations, has been much extended, installations having been brought into use at Slough, Exeter, Taplow, and Wantage Road, while others are in hand at Reading, Newbury, Kingham, etc. Forty-five thousand accumulators for working track circuits, electric signals, etc., were charged during the year, as against thirty-eight thousand during 1915. A total length of 5½ miles of air space cable core telegraph cable was laid during the year, as against 6½ in 1915.

* * *

THE London and North Western and Midland Railways receiving offices at Piccadilly Circus ("Spread Eagle") and at 25, Regent Street, respectively, have been closed, and the business transferred to new premises at Sherwood House, Piccadilly Circus, under the joint control of the London and North Western and Midland Railways. The name of "Spread Eagle" is retained.

* * *

DIRECTORS of the North Eastern Railway have elected Major The Hon. John Dawnay, D.S.O., of Wykeham Abbey, Wykeham, Yorkshire, to be a director, in place of the late Earl of Feversham.

* * *

DIRECTORS of the Furness Railway have elected Mr. G. Mure Ritchie, 2, Cumberland Terrace, Regent's Park, London, N.W., Chairman of the Barrow Hematite Steel Company and the Millom and Askam Iron Company, a director of the Furness Railway, in place of the late Mr. W. B. Turner, Ponsonby Hall, Cumberland.

* * *

ON Thursday, February 8th, the Model Railway Club had a very successful meeting, when its Chairman, Mr. H. W. Greenfield, gave an interesting demonstration of casting. He showed how moulds were made not only in plaster but also in sand, illustrating his remarks by casting wheels, cylinders, and a side frame for a bogie in lead.

The next meeting, which will be held on Thursday, March 8th, will be an exhibit competition night, and readers who would like to attend are requested to write to the Hon. Sec., Mr. T. W. Pitt, 17, Northumberland Avenue, Wanstead Park, E., for particulars.

* * *

IN connection with the wool purchase and distribution schemes of the Government, the Great Northern Railway's Victoria Hotel, Bradford, has been taken over for use as central offices. The hotel was closed to the public on the evening of January 15th in order that the premises might be utilised by the Government staff.

* * *

THE Rosebery Prize for the session 1915-16 of £25, offered in connection with the London School of Economics and Political Science, has been awarded for the monograph on "Workmen's Trains," submitted jointly by Messrs. W. G. Chapman and W. H. Jarvis, both of the Great Western Railway. The monograph will be published in the School series. The Rosebery Prize of £10 for the session 1915-16 has not been awarded. An award of £5 has been made to Mr. A. J. Jenkins, of the Illinois Central Railroad of U.S.A. (London office), whose essay was considered by the examiners to be worthy of mention.

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STONEBRIDGE Park station, on the London and North Western Railway, "Watford New" lines, which was recently burnt out, will not be reopened for the time being.

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OFFICERS and employés in the service of the South Australian Government Railways have responded well to the call of their King and country, the total number of enlistments to June 30th, 1916, being 1,454, as follows: General officers, 39; traffic officers, 87; traffic employés, 307; locomotive officers, 31; locomotive employés, 711; maintenance officers, 23; maintenance employés, 256. The salaried staff, soon after the declaration of war, unanimously agreed to pay to the patriotic fund monthly deductions from their salaries. The total payments made to June 30th, 1916, amounted to over £7,211.

* * *

THE twenty-eighth annual report on railways in the United States for the year ending June 30th, 1915, shows that track mileage includes 253,788·64 miles of single track in operation, and with second, third, and other main tracks, yards and sidings, the total is 391,141·51 miles, an increase of 3,933·20 miles, as compared with the track mileage of the previous year. There are 66,229 steam locomotives, and of other than steam, 273; passenger cars, 55,810; freight cars, 2,370,532; service cars, 98,752. The number of employees listed, including officers, are 1,409,342. Passenger engineers and motormen number 11,274; road freight engineers and motormen, 22,966; yard engineers and motormen, 11,971; total of engineers and motormen, 47,839.

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FIFTEEN hundred 20-ton (metric) four-wheeled high-sided gondola cars, and 500 sets of steel work are being shipped from Montreal to France for the Paris-Orleans Railway. They have a light structural steel underframe, steel side frame, and end frame with wood lining, being of the regular Continental type. The cars are equipped with forged steel drawhooks, cast steel buffers with springs, forged screw couplings and safety chains. The brake arrangement is of the hand lever type, the brake being applied from the ground and operates on one wheel only. They have been built by the Canadian Car and Foundry Co., Ltd.

* * *

THE Northern Ontario Fire Relief Committee has expressed to President E. J. Chamberlin, of

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the Grand Trunk Railway, its appreciation of the assistance rendered by that road in transporting food and clothing to the district when overrun by fire some months ago. The Chairman of the Relief Committee states that the railway has co-operated to the fullest extent in securing the quick despatch so imperative in relief work of this description. "We also wish to express," says the Chairman of this committee, "our gratitude for the very personal interest you have taken in the fire sufferers, which has resulted in such a magnificent service being extended by the Grand Trunk Railway on behalf of these people, not only through the large quantities of relief supplies carried without charge, but also through the granting of free return transportation to those sufferers who had come south after the fire and returned prior to October 31st."

* * *

Mr. George Bury, Vice-President, Canadian Pacific Railway, who is at present on a visit to this country, is a Montrealer by birth and has been connected with the Canadian Pacific Railway since 1883, when he entered its employ as a junior under Lord Shaughnessy. His abilities as a railway man quickly became apparent, and he rose step by step through the offices of Divisional Superintendent, General Superintendent, General Manager of Western Lines and Western Vice-President, to his present high position. He is regarded in Canada and the United States as one of the greatest transportation experts on the American Continent.

* * *

A number of railway employés at North Bay, Ontario, Canada, have associated together with a view to reduce the cost of food supplies by co-operation. A committee was formed to handle purchases, which were generally made in carload lots, with the result that a saving of about 30 per cent. on all commodities purchased has been made.

* * *

It is announced that 180 employés of the Grand Trunk Railway of Canada have been killed in action or have died from wounds received on active service. In addition, several are reported missing and wounded. The total

MR. GEORGE BURY.
Vice-President: Canadian Pacific Railway.

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number of employés who have enlisted is over 3,000 from all grades. If any employé is killed in the course of the war, the company's insurance fund pays the same amount to his relatives as though he had remained in his usual employment.

* * *

CONNAUGHT Tunnel, recently opened for traffic, is one of the greatest of the achievements of the Canadain Pacific Railway. This great work—through the lofty Mount MacDonald—amongst the Selkirk Mountains, is nearly six miles long and double tracked. The opening of the tunnel will greatly facilitate traffic, will open a new route, and will do away with many miles of snow sheds. The Connaught Tunnel will give the Canadain Pacific the lowest grade of any transcontinental railway running through the Selkirk Mountains. It was bored in less than three years under the supervision of Mr. J. G. Sullivan, Chief Engineer of the Western lines, and it is claimed that no undertaking of similar dimensions was ever completed in such a short time.

* * *

FROM the staff of the Victorian Railways, out of a total of approximately 15,111 employés within the prescribed age limits, no fewer than 3,220 have been granted leave of absence to undertake military service, so that the total number of enlistments represents 21·3 per cent. of the total number of employés of eligible age. Of these, 104 employés are known to have been killed or to have died whilst on active service. The Commissioners place on record their appreciation of the splendid generosity of the employés in contributing to the different patriotic funds, and of the gratuitous services rendered by employés in patriotic movements throughout the State, and particularly by the men of the Arden Street workshops in the manufacture of articles for Red Cross purposes, and the men of the Newport workshops in a similar direction, and in the making of emblems for sale on behalf of different patriotic funds. The subscriptions of employés amount to £32,169, and the money has been allocated to the different funds, as indicated hereunder: Belgian Relief Fund £3,345, Unemployment Fund £9,135, Victorian Red Cross Fund £13,200, French Red Cross Fund £6,184, Southern Cross Tobacco Fund £986—total £32,850.

* * *

A GAS-ELECTRIC car which the Canadian Northern Railway is putting on the line on Vancouver Island, between Patricia Bay and Victoria, was formerly operated on the Quebec and Lake St. John Railway, between Quebec and Lake St. Joseph. It is propelled by electric motors on the forward truck, receiving their energy direct from a 375 h.p. generator in the forward compartment of the car, direct connected to a six-cylinder gas engine. The car is 54 ft. long, with seating capacity for 76 passengers, and it is capable of attaining a speed of 55 miles an hour. When operating in Quebec it made four round trips daily, or a total of 175 miles, and the actual operating cost was 16c. a mile, exclusive of repairs.

THE Grand Trunk Railway has undertaken the construction of a new plant at Port Huron, Michigan, for the repair of freight and passenger cars. The principal car repair plant for the lines west of the St. Clair river has been at that point for many years, but was destroyed by fire during the winter of 1914–15. The old plant was of limited capacity, and located at what was the old terminus of the line previous to the construction of the tunnel under the St. Clair river. After the fire, negotiations were carried on between the town of Port Huron and the railroad, resulting in the acquisition of the property recently vacated by the Port Huron Thresher Company, which property is very much more advantageously situated, being near the new tunnel line. The plant will consist of a power house containing six 150 h.p. boilers serving double turbo steam generating units of 300 k.w. for developing the electric power for lighting and operation of machines, all of which will be motor driven; a passenger car shop of two units 135 ft. by a combined length of 545 ft., accommodating 27 modern passenger cars—between the two units will be a transfer table 80 ft. in length; a freight car shop 160 ft. by 360 ft., accommodating 70 freight cars; a cabinet shop, two floors each 73 ft. by 250 ft.; a blacksmith and machine shop 150 ft. by 300 ft.; a wood mill 90 ft. by 210 ft.; a dry lumber shed 48 ft. by 147 ft.; a storehouse 61 ft. by 154 ft.; an office building 61 ft. by 64 ft. These buildings, including trackage, will occupy a space of approximately 55 acres, and are arranged for economical operation, special attention having been given to this feature to ensure maximum efficiency. The total cost is estimated at $700,000.

* * *

THE Grand Trunk Railway has undertaken the construction of a new plant at Port Huron, Michigan, for the repair of freight and passenger cars. The plant will include a power-house containing six 150 h.p. boilers, a passenger-car shop accommodating 27 modern passenger cars, a freight-car shop accommodating 70 freight cars, and a machine shop.

* * *

MR. WALTER REGINALD BAKER, C.V.O., secretary of the Canadian Pacific Railway, and assistant to the president, has at his own request been relieved from his duties and placed on the retired list. Mr. Baker's career with the Canadian Pacific Railway began on the last day of February, 1881, when he was appointed assistant to Mr. A. B. Stickney, then General Superintendent, Western Division, with headquarters at Winnipeg. He is succeeded in his office by Mr. Ernest Alexander, Assistant Secretary, who was from 1893 to 1899 private secretary to Lord Shaughnessy.

* * *

REPORTS as to progress on the Australian Transcontinental Railway show rails on the east to west line were up to November laid for 404 miles in the eastern division and 513 miles in the western division, a total of 917 miles. This leaves about 140 miles yet to be completed.

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Earthworks are constructed over 408 miles in the east, and 514 miles in the west, and the telegraph line has been carried to the railhead in each division. In the western section about 1,000 men are employed, and 1,500 men at the eastern end.

* * *

LORD CLAUD HAMILTON, presiding at the annual general meeting of the Great Eastern Railway Company, said that the total net income for the past year was £2,161,473, or £2,270,422, including the balance of £108,949 from last year's account. This enabled the directors to pay the same dividend as last year—namely £2 10s. per cent.—5s. of which was earned in the first half of the year. The very heavy charges for working expenses of £5,120,799 were mainly due to two bonuses, amounting in all to 10s. paid to the staff, the increase in the price of coal, and a considerable amount of Government work outside of ordinary railway work which they had carried out. The working expenses showed an increase of £304,031 over those of 1915, and £506,477 over those of the preceding year. The total capital expenditure for the year amounted to £101,672. They had lost three ships, with the result that these had been struck out of the capital account. Those three ships stood in the books at £155,061, so that they were £53,389 in credit. They would, in due course, receive payment from the Government for all the vessels lost, and when the money was received it would be utilised towards the cost of replacing those boats. Two of the boats which had been carrying on trade between the Continent and Harwich—namely, the *Brussels* and the *Colchester*—were unfortunately captured. The whole world was horrified to hear that Capt. Fryatt, the plucky and able captain of the *Brussels*, was executed on July 28th by order of the Germans, and the only consolation that could now be looked for was that in due course the chief perpetrators of this outrage might be brought to justice. It was thought fitting that the name of such a national hero should never be effaced from our memories, and it was intended to provide a "Fryatt Memorial" wing to the College Hospital at Harwich. The Board of Trade recommended the grant of an additional pension of £100 per annum over and above the pension to which Mrs. Fryatt and her children were already entitled under the Government compensation scheme, and the Great Eastern Board had informed Mrs. Fryatt that a sum equal to Captain Fryatt's salary would be paid to her for life.

* * *

LORD ABERCONWAY at the annual general meeting of the Metropolitan Railway stated that the revenue for the year available for distribution was more than in 1915 by £14,400, and it was proposed to pay a dividend of 1 per cent. on the ordinary stock. He did not think any proprietor would expect an increased dividend at the present time. The balance-sheet showed that the position to-day, in the matter of reserves, was a stronger one than it had ever been before. What the position of railways generally might be after the war it was impossible to say. There might be legislation involving a continuance of Government control in some form, or there might be even more radical changes; but, whatever happened, it would be all to their advantage that their reserves were substantial and their financial position generally a thoroughly sound one. If, when the present Government control and guarantee were terminated, they reverted to the position of independence that they occupied before the war, they, in common with other railway companies, would be faced with very largely increased expenditure, and unless they were permitted to take steps to enlarge their revenue by the raising of fares and rates it would not be an easy matter to make ends meet. At the request of the Government they had made some reductions in their train services, particularly on their extension lines north of Harrow, but owing to the nature of their traffic it had not been possible to do a great deal in that direction. The general increase of 50 per cent. in fares, which came into operation all over the country on January 1st last, had been confined on their system to places north of Kilburn, the stations south of that point being regarded as within the zone exempted from the advance by arrangement with the Board of Trade and other London Underground Companies.

* * *

AT the Hull and Barnsley Railway annual general meeting Colonel Chas. W. Trotter said the accounts had been further curtailed since the previous general meeting, as directed by the Board of Trade. As to the agreement with the Government for compensation payable for the use of the controlled railways and docks, he expressed the opinion at the last meeting that it was a fair one, apart from the question of interest on capital expenditure on works brought into use since December, 1912. He then informed the proprietors that this matter was under discussion between the Government and the Railway Executive Committee, and he was glad now to be in a position to tell them that the principle of allowing such interest had, he thought, been satisfactorily settled. During the year the company had expended £96,825 on capital account, mainly on works, such as the King George Dock and the Hull and Barnsley and Great Central Joint Railway, to which expenditure they were committed before the commencement of the war, and a further considerable expenditure would be incurred before these commitments were fully met. He thought they could reasonably expect that £15,000 would be sufficient to pay their moiety of the cost of completing the works now in hand on the joint line and £150,000 on those of the King George Dock.

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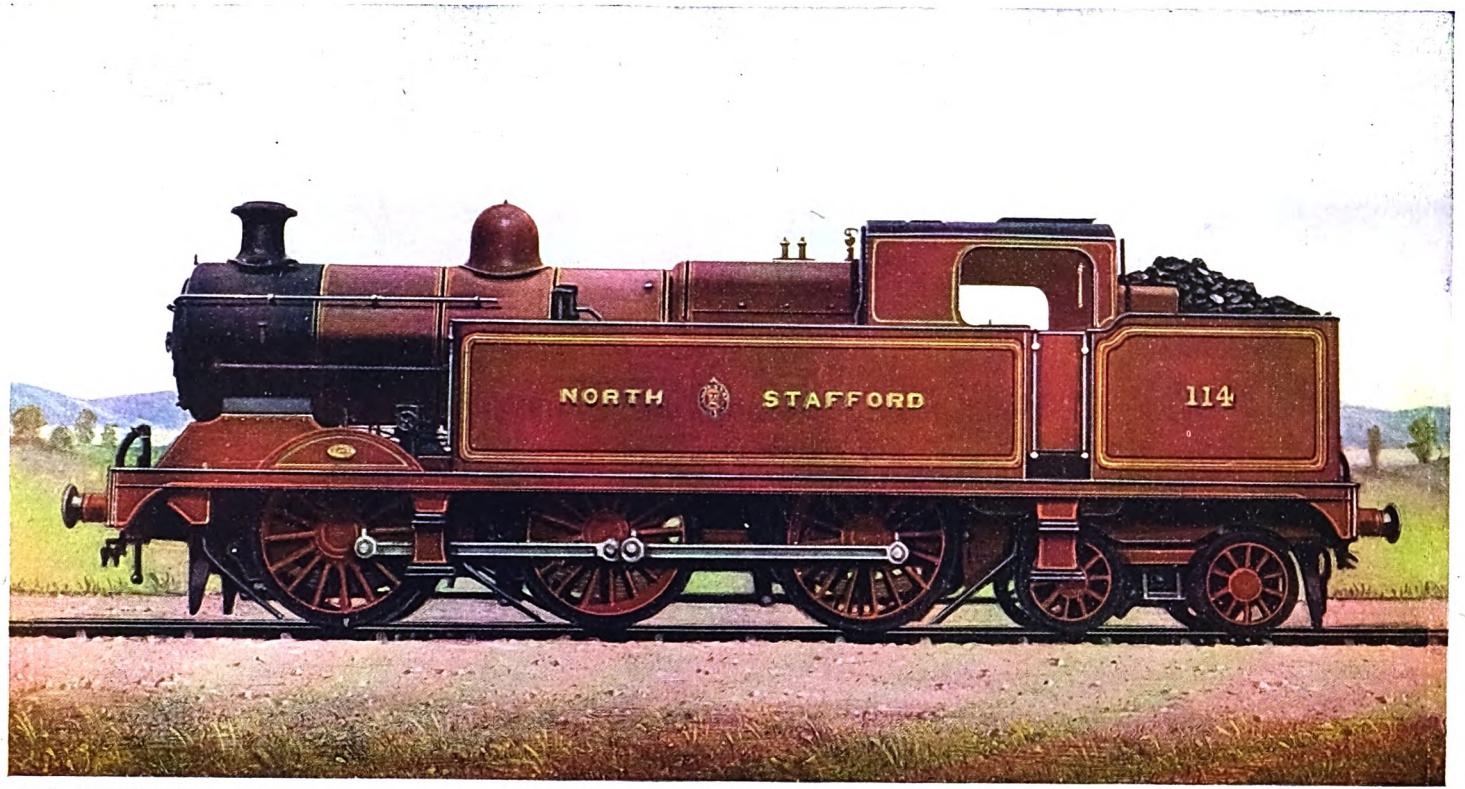

THE RAILWAY MAGAZINE.

0—6—4 PASSENGER TANK ENGINE, No. 114, NORTH STAFFORDSHIRE RAILWAY.

Fitted with Robinson Superheater and Wakefield Mechanical Lubricators.

Cylinders: 20 in. by 26 in. Coupled wheels: 5 ft. 6 in. diam. Steam pressure: 160 lbs. per sq. in. Tank capacity: 2,250 galls. water. Bunker holds 3½ tons coal. Total weight in working order: 77.35.

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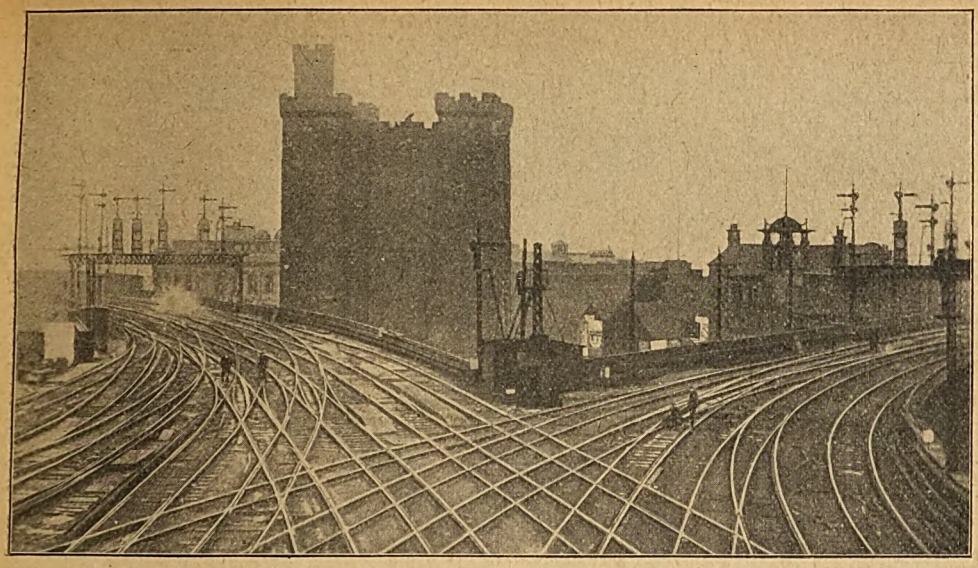

LARGEST RAILWAY CROSSING IN THE WORLD.
Newcastle-on-Tyne, North Eastern Railway.

The Largest Railway Stations in the United Kingdom.

By J. F. GAIRNS.

DISTINCTION as "the largest," whatever the particular application, always lends interest; but in dealing with the subject now under review one has to bear in mind not only the claims of the respective stations to be considered, but also in what way they shall be regarded as calling for inclusion. It is not sufficient to institute comparison on the basis of area occupied, number of platforms, totals of trains dealt with, numbers of passengers and other possible aspects.

For instance, one station may be so located that expansion has been achieved under very great difficulties and at enormous expense, whereas another with large acreage may devote a considerable proportion of its space to approaches and yards, administrative premises, hotel, etc. Again, there may be a large number of platforms each capable only of taking one long train, or several platforms may be designed for at least two trains. There may be few or many shunting and stand-by tracks in the station. Further, traffic may be dealt with at both ends, or at one end only, while there are instances where a low-level or local station has to be considered as part of the whole, particularly if passengers for the same destinations may use one or the other according to where individual trains are to be found. In addition, one big station may deal with a moderate number of trains daily and yet require to be classed high, owing to the majority of these being express and main line trains; while another bases its claims for exceptional consideration on its large totals of suburban trains. A further complicating factor is the uncertainty which arises as to the necessarily variable limits which are adopted in reckoning station area, the inclusion or exclusion of goods yards and lines, of office, yard, approach and hotel areas, of associated engine and carriage lines, and whether the boundaries are placed at the outermost set of points involved in actual access to a platform line, or reckoned as covering the whole area wherein traffic is directly under the control of the station signal cabins. It will therefore be seen that without instituting an exhaustive series of enquiries it is impossible to provide a conclusive answer to the frequent query as to which is the largest station in the United Kingdom, and even then the absence of a definite standard renders any comparisons

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LARGEST RAILWAY STATIONS IN THE UNITED KINGDOM.

Several stations have an associated "Low Level," "Underground," "Suburban" or other station whose traffic should be considered as part of that of the main station. These are added as indented entries following those of the principal station. Terminal lines, where there are bays at each end, are differentiated as N., S., E., W., according to the traffic direction they serve, and not necessarily strictly according to the points of the compass. Numbers of trains (in and out) in 24 hours are stated in round figures on an approximate basis only. "Other through lines" may be treated as sidings, but are reckoned where they provide a through passage for trains.

Station.	Railway.	Total Platform lines.	Total other tracks.	Total through platform lines.	Total other through lines.	Number of Terminal platform lines.	Number of trains 24 hours.	Area occupied (acres).	Length of longest platform (ft.).	Total lengths of platforms (ft.).
Waterloo	L. & S.W.R.	21 | 2	2	—	—	21	1,092	24½	720	14,500
Waterloo and City	—	—	—	—	—	2	—	—	—	—
Edinburgh (Waverley)	N.B.R.	17 |	9	2	4	7W—8E.	} 1,000	18	1,680	13,980
Suburban	—	2	—	2	—	—				
Liverpool Street	G.E.R.	18	2	—	—	18	1,050	16	900	11,379
Clapham Junction	L. & S.W. & L.B. & S.C.Rlys.	17	—	17	—	—	1130+600	24¼‡	—	—
Glasgow (Central)	C.R.	13 |	—	—	—	13	600	—	1,040	9,080
Low Level	—	4	—	4	—	—	—	—	—	—
Victoria	L.B. & S.C.R.	9=16	4	—	—	9=16	700	14	1,500	11,430
Crewe	L. & N.W.R.	16	3	6	3	10	—	—	1,509	11,650
Euston	L.N.W.R.	15	10	—	—	13	270	18	—	10,776
Birmingham (New Street)	L.N.W.R.*	15	8	8	4	5N.—2S.	760	14	—	8,550
Newcastle (Central)	N.E.R.	15	8	3	8	5W.—7E.	954§	17	1,389	10,600
York	N.E.R.	14	7	3	2	6N.—5S.	330	—	1,480	11,701
Paddington	G.W.R.	12 |	—	—	—	12	350	—	850	—
Bishops' Road	—	2	1	2	1	—	40†	—	—	—
King's Cross	G.N.R.	11 |	7	—	—	11	} 500	15¾	—	8,268
York Rd. and Suburban	—	2	—	2	—	—				
Nottingham (Victoria)	G.N. & G.C.	12	5	4	5	4N.—4S.	180	12¾	1,270	8,135
Glasgow (St. Enoch)	G. & S.W.R.	12	2	—	—	12	500	13½	1,100	9,561
Manchester (Victoria)	L. & Y.R.	12	3	6	3	6E.	780	13¼	—	9,420

* Operated as a joint station with Midland Railway.
† Not including Hammersmith and Addison Road electric services.
‡ Including both sections, but exclusive of about 10½ acres of sidings.
§ On Saturdays the total is about 1,140.

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questionable even when the leading factors become in some degree equivalent. However, while it may be impossible to settle the matter on an absolutely conclusive basis, it is still practicable to get somewhere near the facts, and a general discussion of the subject, utilising data gathered from the comprehensive series of articles published in the RAILWAY MAGAZINE from time to time under the title of "Notable Railway Stations," and from other sources will be of value.

The least conclusive basis of comparison is that of area occupied, as many of the great railway termini also accommodate the general offices of the company, and there may also be a large modern hotel. However, these are legitimately included, especially as the general offices are frequently erected over station premises, or arranged compactly along the station walls and in other ways to allow effective utilisation of space. But it is necessary to separate as far as practicable goods station area, however closely associated it may be with the passenger premises.

MR. E. J. PRINCE.
Station Superintendent, Waterloo Station, London.
London and South Western Railway.

In this respect the honours appear to be claimed by the London and South Western Railway terminus at Waterloo, as enlarged; but the North British Railway Waverley station, Edinburgh, is entitled to a very high second place. The former includes general offices, but not an hotel, whereas the reverse is the case at Waverley. The latter is, however, necessarily much more compact, and its road approaches are largely over area which is correctly devoted to the working of traffic, while at Waterloo a very small proportion of the area is thus doubly occupied.

Therefore while Waterloo with its 24½ acres must take first place, it is probably more correct to give that station credit as the largest in England, and Waverley as the largest in Scotland, bracketting them in regard to the United Kingdom. In this connection the 23 acres generally attributed to Waverley are reduced to 18 acres, in view of the fact that the goods station directly alongside, and very closely associated, occupies about 5 acres. The suburban station alongside is, however, included.

Here a further complication comes in, seeing that Euston also claims about 18 acres. But as a long range of offices, extensive yards, a considerable number of siding roads, the famous arch and the hotel appear to be included, it is probably correct to place this world-known station third in this respect.

Newcastle (Central) North Eastern Railway, covers about 17 acres. Covered area aggregates 7½ acres. Virtually all the space belongs to the station proper, though the acreage stated includes also the lines alongside used for goods trains but not of goods yard character.

Liverpool Street, Great Eastern Railway, comes next, with 16 acres, though both general offices and hotel are provided. The arrangement is, however, so exceptionally compact, as is inevitable where property so valuable as is that in this part of the City of London is concerned, and consequently the Great Eastern terminus also requires to be rated highly, whatever its actual position in order of area may be.

Closely following is King's Cross, Great

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Photo] [*Topical.*

THE NEW CIRCULATING AREA, WATERLOO STATION, LONDON.
London and South Western Railway.

WAVERLEY STATION (EAST END), EDINBURGH.
North British Railway.

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Northern Railway, with 15½ acres. This includes, of course, the suburban and York Road stations, together with the hotel and the somewhat extensive area in front and at the side of the main station, but the general offices are compactly arranged over legitimate station area.

New Street, Birmingham, owned by the London and North Western Railway, but operated under a joint London and North Western and Midland Committee, covers an area of about 14 acres, and this is equalled by the London, Brighton and South Coast Victoria station in London. The latter, with 7 of its 9 platforms ranking as end-on pairs, has to be included on a special basis.

About equal in size are the great Lancashire and Yorkshire Railway Victoria station in Manchester, the

MR. W. JOSLIN.
Stationmaster, Liverpool Street Station, London.
Great Eastern Railway.

MAIN LINE DEPARTURE PLATFORM.
Liverpool Street Station, London, Great Eastern Railway.

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MR. F. C. WILSON.
Assistant Stationmaster, Liverpool Street Station, London, Great Eastern Railway.

Glasgow and South Western Railway St. Enoch terminus, the Glasgow (Central) station of the Caledonian Railway (this would probably be larger if the low level station is included), but exact figures as to areas are not available in all these cases. The joint Great Northern and Great Central Victoria station at Nottingham covers about 12¾ acres, and other notable large stations are those at Crewe and York. In Ireland the honours lie between the Great Southern and Western Railway station at Cork, and the Great Northern station in Belfast. None of the Dublin stations are particularly large, though Kingsbridge and Broadstone are architecturally notable, as is also Amiens Street in a different way.

In regard to numbers of platforms one is on surer ground, though even here one has to take into account whether platforms are adapted for one or for two trains of reasonable length. In this respect Waterloo is undoubtedly first, with 21 platforms, and this number will be increased to 23 when the full improvement scheme now in progress is realised. Indeed, one may also include the underground Waterloo and City station, with two further platforms, as this line is also South Western. None of the Waterloo platforms are, however, regularly intended for two trains simultaneously.

Next again comes Waverley, Edinburgh, with two very long platforms on either side of the great island for which it is noted, and these will each take two full-length trains and allow of shunting to and from them in addition. There are 15 bays, and 2 through platform lines in the suburban station, 19 in all.

Liverpool Street, London, has 18 platforms, more compactly arranged than at any other station of its type, and by including the four Low Level platforms, Glasgow Central comes next with 17. Victoria (London, Brighton and South Coast Railway) is entitled to claim 16, as 7 of its 9 platform lines are designed for two trains each with independent access or egress. Crewe also has 16 platforms, 6 through and 10 bay. Euston has 15 platforms, and this total also applies to New Street, Birmingham, 8 of the latter being through, while the peculiar Stour Valley arrival platform is also reckoned. Newcastle Central also claims 15, of which 3 are available for through traffic.

Paddington station, as enlarged, has 12 platforms in the main station, and there are two others at Bishops' Road, used to some extent by purely Great Western trains, and otherwise by electric trains jointly owned with the Metropolitan Railway. York station also claims 14 platforms, 3 for through traffic and 11 bays. King's Cross has 13, including the Suburban (down) and York Road (up) stations.

With 12 platforms there are St. Enoch (Glasgow), Manchester (Victoria) and Nottingham (Victoria). One might also cite among the large stations Lime Street (Liverpool), Exchange (Liverpool), the Central stations in Manchester and Liverpool, and the joint London and North Western and Great Central London Road station (together with Mayfield) in Manchester; while there are several other stations which would have to be considered with from 8 to 11 platforms.

There are, however, three stations not yet mentioned which really claim very high positions in this connection. The first is Clapham Junction, perhaps the most famous junction in the world. It is, however, a double station with 6 platform lines in the Brighton portion (including two for West London traffic) and 11 in the South Western portion, 5 in the main line portion and 6 (2 used for West London and miscellaneous traffic) on the Windsor side. Clapham

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Junction is, further, unique in that it has no fewer than three substantially distinct four-track avenues of traffic, besides other lines.

The other two stations are those jointly owned by the Lancashire and Yorkshire and North Western Railways at Blackpool, these calling for remark in view of the special excursion platforms provided in addition to the ordinary platforms. At Talbot Road there are 9 extra platforms, making 15 in all, and at Central 6; total 12.

In regard to through lines at the stations noted, Clapham Junction has the whole of its 17 platforms so served, and the next largest in this respect is New Street, Birmingham. There are, however, many other stations which provide 6 or even more platform lines of through character. On a terminal basis the order is Waterloo (21), Liverpool Street (18), Victoria, London (9 = 16), Waverley (15), Talbot Road, Blackpool (9 + 6), Euston (13), Glasgow Central (13), Paddington (12), Newcastle Central (12), Glasgow, St. Enoch (12), Blackpool Central (6 + 6), York (11), King's Cross (11), Crewe (10).

At most of the big terminal and other stations space is too valuable to allow of much accommodation being provided in the way of extra tracks; but in some cases this is unavoidable. Some of these lines are shunting tracks, or for changing engines and remarshalling, but others are of a lay-by character, or provide for other requirements. Euston has no fewer than 10 of these lines (one or two somewhat short) and Waverley 9, including the four through lines outside the big island, one or two sidings beyond, and central roads to some of the bays. New Street, Birmingham, has 7 such lines, Newcastle Central 8 (some of these are for passing goods trains) and King's Cross and York 7 each.

On the basis of total tracks the order is: Waverley (19 + 9 = 28); Euston (15 + 10 = 25); Waterloo (21 + 2 = 23); New Street, Birmingham (15 + 8 = 23); Newcastle, Central (15 + 8 = 23); York (14 + 7 = 21); Liverpool Street (18 + 2 = 20); King's Cross (13 + 7 = 20); Victoria, London, Brighton and South Coast Railway (9 = 16 + 4 = 20).

Full statistics not being available as to the total lengths of platform-edge, it is only practicable to give a few particulars. Waterloo leads with 14,500 ft., and Waverley follows with 13,980 ft. Almost equivalent are Victoria (London, Brighton and South Coast

Photo] [*Topical.*

HISTORIC SCENE AT EUSTON STATION, LONDON.
Arrival of survivors of the submarined *Lusitania* in London, May 9th, 1915.

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MR. J. JONES.
Stationmaster, Euston Station, London.
London and North Western Railway.

Railway) with 11,430 ft. and Liverpool Street with 11,379 ft. Other stations above 10,000 ft. are Euston with 10,776 ft., and Newcastle Central with 10,600 ft.; but Talbot Road, Blackpool, including the excursion platforms, aggregates 9,900 ft.

A frequent matter of controversy is that of the greatest length for a single platform. This need not be at a great terminal or junction station, but circumstances generally entail that it shall be so. Honours in this respect again apply to Waverley, its two main platforms each extending for no less than 1,680 ft. Crewe comes next with 1,509 ft. for the long No. 1 platform, but at Victoria (London, Brighton and South Coast Railway) several of the " double " platforms are 1,500 ft. long. York follows closely with 1,480 ft. Newcastle Central has to be content with 1,389 ft.; and the famous single through platform at Cambridge has a length of 1,375 ft. At Rugby the faces of the island are 1,322 ft. long, and at Leicester (Great Central Railway) they extend for 1,245 ft., slightly less than in the joint station at Nottingham, where the length is 1,270 ft. The longest platform at Glasgow, St. Enoch, is 1,100 ft. long. At Glasgow Central the extreme length is 1,040 ft.

It is now necessary to deal with the most difficult aspect of all, that of numbers of trains dealt with in a weekday twenty-four hours. For this purpose it is generally necessary to dissociate the traffic of associated stations where it is of an essentially different character. Thus at Waterloo the City trains on the Waterloo and City line must be omitted; at Paddington the electric Hammersmith and City trains, but not those of the Great Western Railway itself at Bishops' Road. On the other hand, it is quite legitimate to include trains at King's Cross Suburban and York Road, Waverley Suburban and Glasgow Central Low Level, as these essentially belong to the traffic of the respective railways. If the electric services mentioned were included huge totals could be built up, seeing that only 10 trains per hour (6-min. intervals) in each direction for 18 hours realises 360, and as some of them require to be reckoned for both arrival and departure—to correspond with reckoning in the main station—a total of 720 is at once obtained, and that for two platforms only.

On the same basis, the underground and tube railways in London challenge the figures of any of the great terminal stations. Thus at stations from Mansion House to Gloucester Road, reducing the maximum of 44 trains per hour each way realised during the rush periods to an average of 25 per hour

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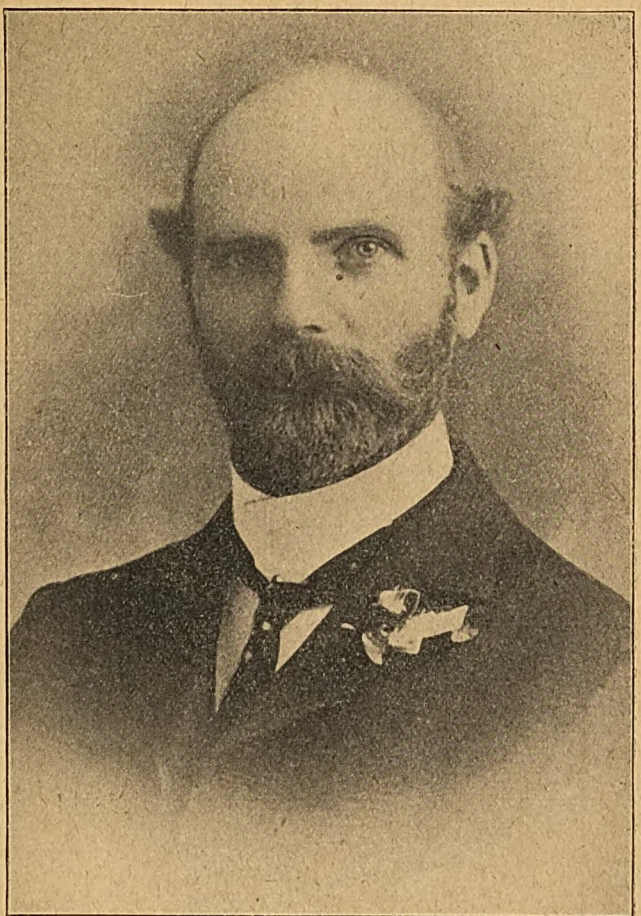
in each direction for 20 hours, a total of 1,000 is reached. And if this is duplicated for both arrivals and departures 2,000 is obtained. It is understood that this is slightly in excess of the real figures, but sufficiently near the mark for reference in round figures. At Earl's Court, as the High Street and terminating trains exceed the Circle trains taken from the Mansion House–Gloucester Road section, the total is approximately higher than 1,000 or 2,000, according to the reckoning adopted.

In the same way the Metropolitan section of the Inner Circle cannot be more than one or two hundred fewer; and the tubes would also require five or six hundred trains to their credit each.

Apart, therefore, from such examples, Clapham Junction must undoubtedly take first place. As a through station it would not be fair to include both arrivals and departures, though the relatively few terminating trains may be so reckoned; and there is the added complication that so many trains, both main line and local, pass without stopping. Even before the South Western electrification, however, the totals would certainly be exceptionally high, seeing that virtually all the Waterloo trains—probably the largest for a non-composite station—are supplemented by the considerable figures on the Brighton side.

With both railways operating electric trains, the claim for supremacy in this respect on behalf of Clapham Junction has become incontrovertible. On the South Western side, now that no fewer than 23 electric departures are given hourly from Waterloo, these alone give 322 each way for 14 hours, or certainly 400 for the 24 hours. The actual figures on the South Western side are about 1,130, and to these must be added some 500 trains in and out of Victoria, London, Brighton and South Coast Railway (separating those of the South London line) and about 100 on West London and other traffic. That is, about 1,730 trains daily, either stopping or running through, and reckoning each once only. And this is probably an under-estimate, besides which there are many goods trains and light engines. No account has been taken of traffic to and from the London and South Western Railway carriage sidings in the centre. Such figures as these can hardly be challenged by any other station, partly because the number of comparable examples is naturally very small, especially as it would be difficult to specify any instance where so full and varied an electric service is run as on the South Western, and it would still be difficult to find a case where the other railway concerned also operates frequent electric trains.

Due partly to its great size, but mainly to the fact that its already heavy suburban traffic has been vastly increased under



MR. T. C. HUMPHREY.
Stationmaster, York, North Eastern Railway.

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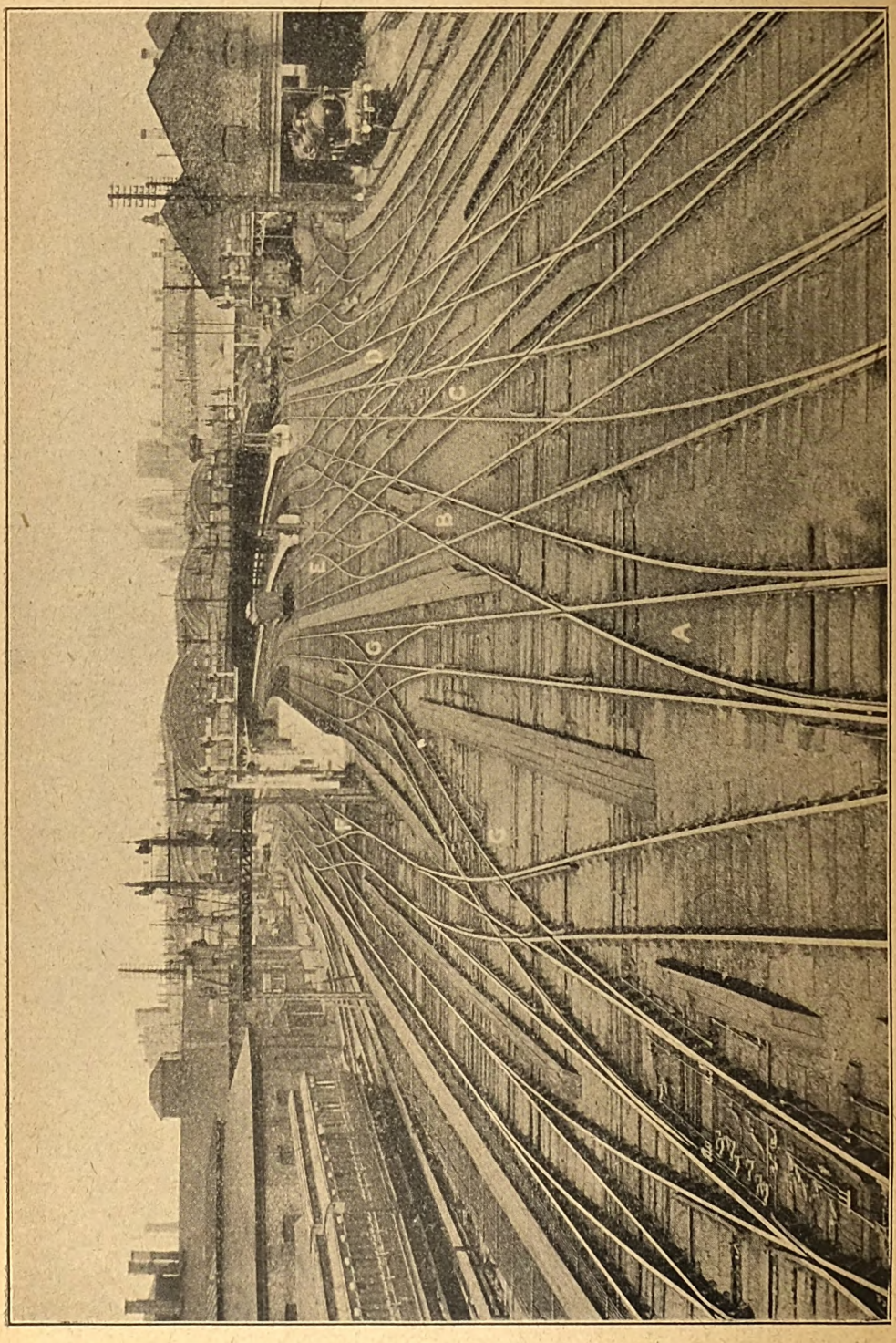

SOUTH END OF YORK STATION, NORTH EASTERN RAILWAY.

Typical arrangements of permanent way are indicated by the reference letters as follows:
A. Single Junction. B. Diamond Crossing. C. Single Slip. D. Double Slip. E. Crossover Road. F. Scissors Crossing. G. Special Scissors Crossing.

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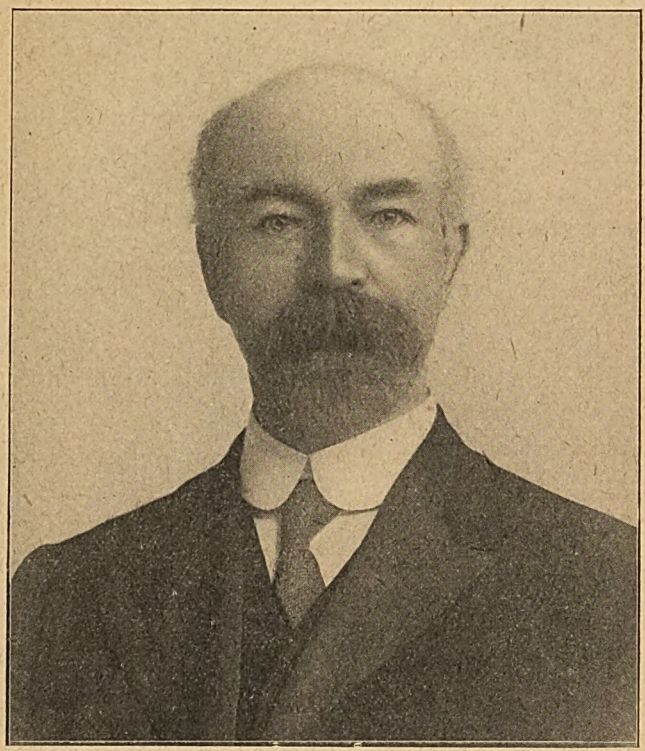
electrification, Waterloo undoubtedly claims first place for total trains dealt with. Under old conditions the aggregate of arrivals and departures, with empties and engines, was certainly well over 900 in 24 hours, and the number is now about 1,100. At a terminus it is, of course, correct to reckon both arrival and departure, as these movements have to be independently arranged for, and the same would also apply at stations such as York and Carlisle, and at Waverley, whether terminal or through lines are used. Hence remaining totals noted are of this dual character.



MR. W. THOMPSON.
Stationmaster, Newcastle-on-Tyne,
North Eastern Railway.

The next highest total is claimed for Liverpool Street, about 1,050 per day, but Waverley comes very close with nearly 1,000. The latter total is, however, somewhat inconclusive, as it is not quite clear whether it is based on train totals or on traffic movements. At a station like Waverley this distinction would amount to a considerable factor. At any rate, Liverpool Street is notable not only for the large numbers of trains, principally of a suburban character, but also for the enormous numbers of passengers who detrain and entrain at Liverpool Street, and in this respect it is almost unchallengably the busiest station in the United Kingdom.

It is difficult to obtain figures which will be unanswerable for this comparison, for there are so many complicating factors, such as the through travelling of local passengers at King's Cross (Suburban and York Road) and at Bishops' Road, Paddington. The same may also be said of Glasgow Central station in regard to the Low Level lines, but in a lesser degree. However, Victoria station, Manchester, appears to come next with about 780 trains (mostly terminal, but with a considerable number leaving and departing on the through lines), followed by New Street, Birmingham (two railways), with about 760. The Brighton side of Victoria station deals with about 700 trains in and out daily, while at Newcastle Central the total is 954 on a weekday and about 1,140 on Saturdays, when so many extra trains are run for the benefit of the numerous pit villages around. King's Cross has about 500 train movements a day, including, of course, the through underground trains; and Paddington realises about 400, including steam trains at Bishops' Road, but not the Hammersmith and City electrics.

Compared with some of the totals cited, Euston's total of about 270 appears relatively insignificant, and that for a station with 15 platforms; but the North Western terminus is probably unique in regard to the very large proportion which is of a main line character. Indeed, the ordinary suburban traffic is still a secondary factor, seeing that so much of what would on other lines go to the main terminus is dealt with by the Broad Street trains and by interchange with the tubes. When the full electrification scheme is completed, and independent electric lines are available from Chalk Farm to Queens Park, there will, no doubt, be a considerable accession of trains at Euston; but meanwhile this is primarily a main line terminus, with more platforms and space devoted to

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such traffic than at any other corresponding station (Paddington is the nearest equivalent, and even there a considerable volume of what is really long-distance residential traffic is dealt with), while the London and North Western Railway also claim a good portion of traffic to and from the Broad Street lines and over the Baker Street and Waterloo section of the London Electric Railway.

At Broad Street (9 platforms) there would be between 400 and 800 arrivals and departures in normal times in 24 hours, but present totals are considerably less. The same may be said of some of the other totals cited, but to a considerably lesser degree.

In conclusion, the outcome of the foregoing discussion produces the following results: Waterloo, London, has the largest station area (24½ acres) in England, while Waverley, Edinburgh, follows and is the largest in area in Scotland (18 acres), that acreage also being claimed for Euston.

Waterloo also has the greatest number of platforms (21 + 2 on the Waterloo and City), Waverley following with 17 + 2 in the Suburban station, while Liverpool Street comes third with 18.

Waverley has the highest track total (28), followed by Euston with 25, and New Street, Birmingham, and Newcastle Central with 23 each.

Clapham Junction has the largest number of through lines (17).

Waterloo has the most terminal lines (21), Liverpool Street coming next with 18.

Waterloo also claims the greatest length of platform face, 14,500 ft., followed by Waverley with 13,980 ft.

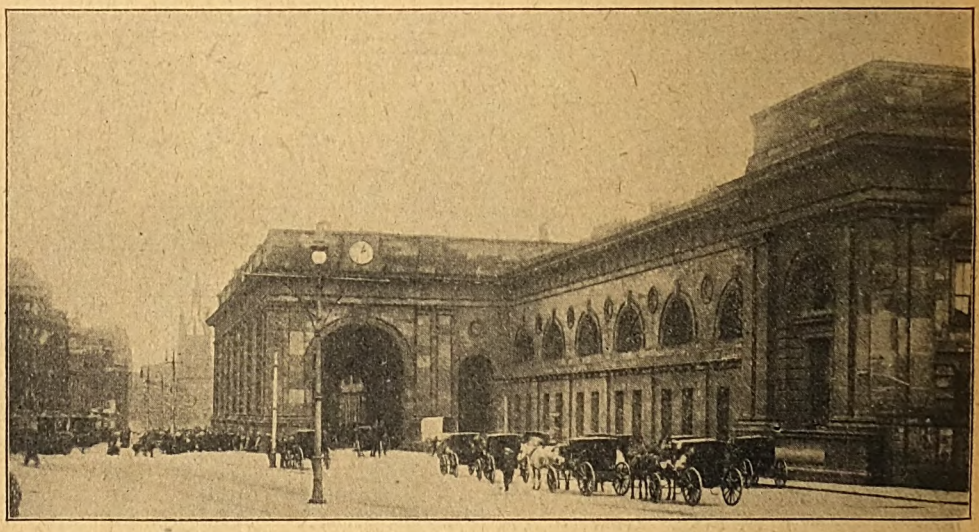
Waverley claims the longest individual platforms, 1,680 ft. long; but Crewe No 1 is 1,509 ft., and the dual platforms at Victoria (London, Brighton and South Coast Railway) are 1,500 ft. long, while York closely follows with 1,480 ft.

By far the highest number of trains passing through in 24 hours is found at Clapham Junction (1,700); but on the same basis Earls Court (1,100) and stations on the Metropolitan District (1,000) and Metropolitan (800) Railways would provide good comparisons, with 4 or 2 platforms only.

Waterloo has about 1,100 arrivals and departures in the course of 24 hours, and on a similar basis Liverpool Street takes second place with about 1,050.

Euston ranks as the largest terminus concerned principally with main line traffic, Paddington coming second.

To sum up, it has to be acknowledged that Waterloo must be regarded as "The Largest Station in the United Kingdom," Waverley, Edinburgh, as "The Largest in Scotland," also occupying a very high place in regard to the whole of the kingdom, while Liverpool Street and Euston are, in different ways, effective candidates for third and fourth positions. For stations of its class, Clapham Junction is unique, and it is certainly the largest through station, though owned by two railways and operated in two distinct sections.



CENTRAL STATION, NEWCASTLE-ON-TYNE.
North Eastern Railway.

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KITCHEN WITH ELECTRIC OVENS.

REST ROOM.

Photo] A DINING ROOM. DINING ROOM ON GROUND FLOOR. *[Topical.*

SOCIAL CLUB AT EARL'S COURT FOR FEMALE ADMINISTRATIVE STAFF, LONDON UNDERGROUND RAILWAYS.

The Club is described on page 295.

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A Notable Change in Chief Engineers.

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

MR. CHAS. L. MORGAN, as briefly stated in the March RAILWAY MAGAZINE, has retired from the position of Chief Engineer of the London, Brighton and South Coast Railway, and accepted a seat on the board of directors of that company. Mr. Morgan began his professional career as a pupil with the late Mr. Edward Wilson, M.Inst.C.E., in June, 1870, and has been actively engaged in works in connection with his profession from that date. For the first seven years he was engaged on important Parliamentary schemes, and as an Assistant in the construction of the Great Eastern Railway's Metropolitan lines, including the first Liverpool Street station, London, and on several railways in the West Midland district of the Great Western Railway. From 1877 until 1883 he was with Messrs. E. Wilson & Co. (the successors to the late Mr. Edward Wilson), and during that time he was actively employed on all the new works that firm were carrying out for the Great Eastern, and was Resident Engineer on the Banbury and Cheltenham Railway, but principally engaged at the Head Office at Westminster as Chief Engineering Assistant. From 1883 until 1896 he was with Mr. John Wilson, the Engineer-in-Chief of the Great Eastern Railway, as Chief Engineering Assistant at the Head Office at Liverpool Street station, and was engaged during the whole of that period on the maintenance works on the system, including the renewal of a large number of bridges and also all the new works then in progress for the Great Eastern Railway, including the widening of the London approach lines and of Liverpool Street station. In February, 1896, he was appointed Chief Engineer to the London, Brighton and South Coast Railway, and that office he has now relinquished to take a seat on the board. During the latter period vast improvements have been made in the engineering features of the Brighton Railway, the line being quadrupled from Victoria terminus to near Balcombe, about 32 miles from London in the direction of Brighton, and these works included the reconstruction of most of the stations along that section of the line and the widening and entire reconstruction of Victoria station, and also the widening of the railway over the River Thames. It is understood that Mr. Morgan will not be entirely giving up his engineering work, but will probably be seen in the Committee Rooms of the House in Parliamentary practice, where he is so well known, and as a member of the Advisory Expert Committee to the Ministry of Munitions, the country will continue to have the benefit of his long engineering experience.

Mr. J. B. Ball, the Engineer-in-Chief of the Great Central Railway, has been offered, and accepted, the appointment of Chief Engineer to the London, Brighton and South Coast Railway, in succession to Mr. C. L. Morgan. Mr. Ball joined the staff of the Great Northern Railway in 1890, and subsequently assisted Mr. R. Elliott Cooper, Past President of the Institution of Civil Engineers, upon the construction, amongst other works, of the Lancashire, Derbyshire and East Coast Railway. In 1899 Mr. Ball became Engineer to the Lancashire, Derbyshire and East Coast Railway, which position he held until that railway was absorbed by the Great Central Railway, and in January, 1906, he was appointed head of the New Works Department of the Great Central Railway, and later, on the retirement of Mr. C. A. Rowlandson in 1911, he was made Engineer-in-Chief. During Mr. Ball's tenure of office on the Great Central Railway he has been responsible for many heavy development works covering an expenditure of several millions, amongst these being the equipment of the Immingham Dock; the removal of two heavy tunnels at Sheffield, and the widening of the lines consequent thereon; the important widenings between Doncaster and Thorne and Wrawby Junction and Brocklesby; and the new Keadby Deviation Railway, with its combined railway and roadway bridge with a lifting span of some 165 ft. over the River Trent. In 1906 Mr. Ball was President of the Permanent Way Institution, in the incorporation of which he was largely concerned. Mr. Ball is a Member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers, and is also a Major in the Engineer and Railway Staff Corps.

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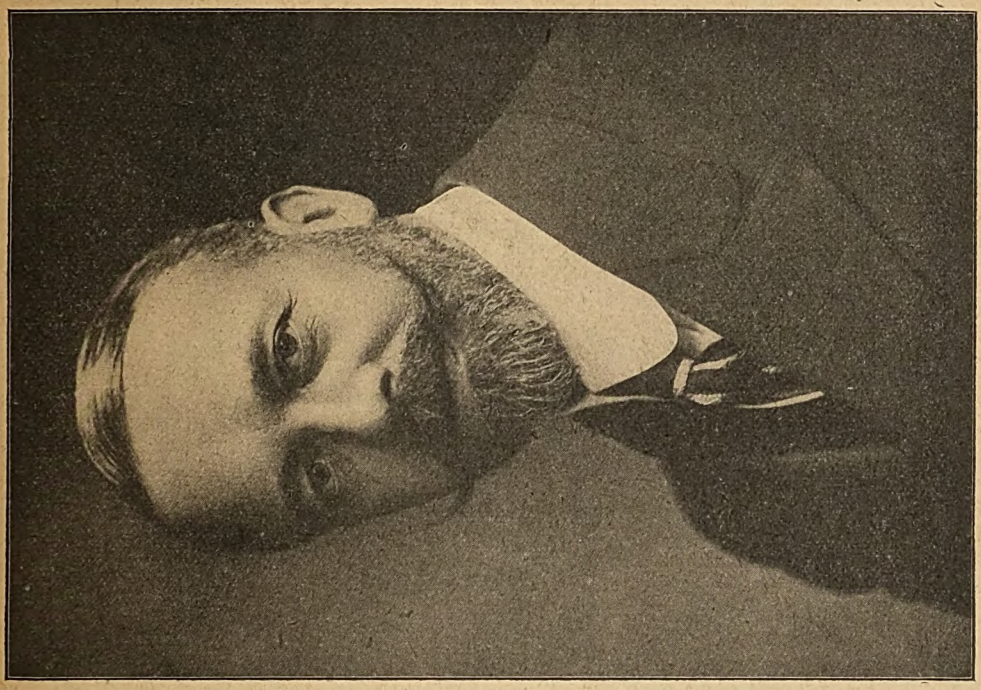
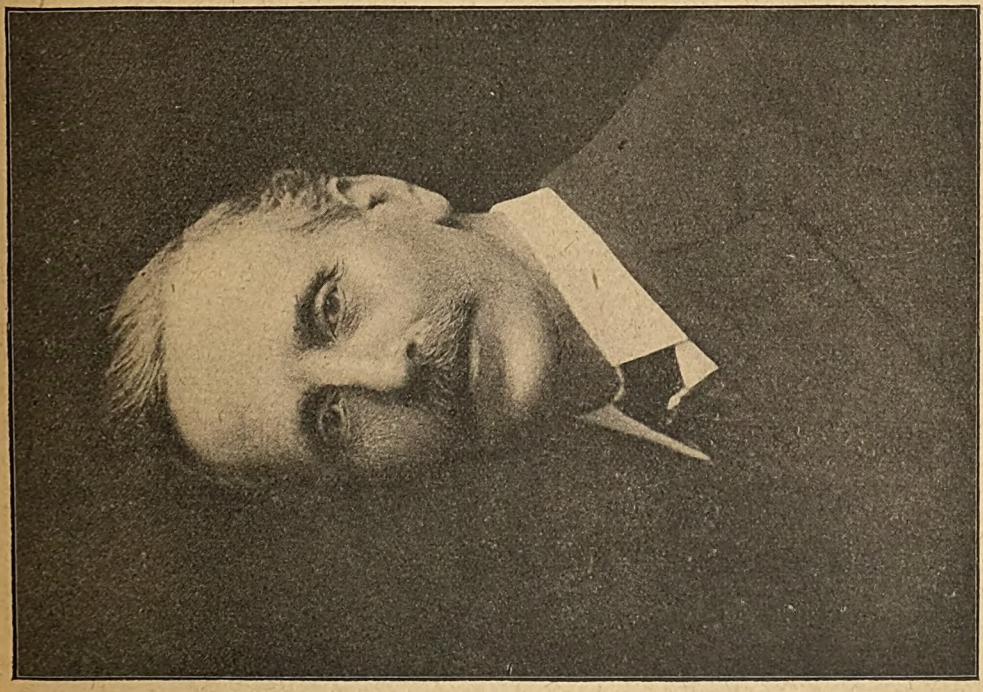


MR. J. B. BALL.
Appointed Chief Engineer, L.B. & S.C. Railway.



MR. C. L. MORGAN.
Chief Engineer, 1896-1917, L.B. & S.C Railway.

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Cooking for an Army on Canada's Military Railway Trains.

WHEN the full account is written of Canada's participation in the war there will be no more noteworthy chapter than that dealing with the methods employed in transporting this great army of men from the training areas to the seaboard, over distances, in many instances, of thousands of miles, and thence from our Atlantic ports to the English camps and the trenches of Flanders and France.

One side of this work which stands out most clearly is the use of the military dining cars which have been specially created in Canada to provide our soldiers with meals while on their long railway journeys. No country in the world ever faced the problem of carrying over so great a distance by rail so many men and to meet the situation something new in railroad equipment had to be provided to attend to the cooking and serving of meals. The ordinary dining car, as compact as a watch in its arrangement, can feed thirty people at one sitting, but how to dine hundreds of men at one time was the problem.

That the difficulty has been mastered in splendid fashion is a compliment to the dining car experts of Canada, and particularly to Mr. E. W. Smith, Superintendent of dining and parlour car service, Grand Trunk Railway System. So successful have been the methods adopted on the Grand Trunk that they have attracted the attention of authorities in all parts of the world and were recently inquired into by the United States Government.

The Grand Trunk Commissary Car is the largest travelling kitchen ever devised. It is 80 ft. long, has a full-sized hotel range 10 ft. in length, steam-cooking apparatus and 60-ft. refrigerator space and store-room capacity for many tons of provisions. Eight cooks work in it without confusion, while a passageway running the whole length of the car allows the military waiters to pass on their way to and from the coaches.

In the movement of a battalion two of these cars are used, the military special being run, as a rule, in two sections. The commissary car is placed in the centre of the train in order that it is easy of access from all the coaches. When a battalion entrains the Commissary Department is always the subject of keen interest among the men in khaki. The military cooks are for the time being out of action. The comfort of the men, so far as diet is concerned, depends upon the railway's crew, in charge of a specially chosen steward. The system of service is explained to the soldiers by the steward at the first meal on the train.

The non-commissioned officer in each coach appoints his own waiters. Punctually as the minute hand of the watch reaches the meal hour the waiters from the first car on the train and the last car walk through to the commissary. The cooks have been preparing for hours and everything is ready and piping hot. Along the great counter is spread the various portions of the meal. It is breakfast time and the morning menu calls for oatmeal porridge, meats, potatoes, bread and butter, jam and coffee. Two men take the big trays of meats and potatoes, another the bread, already sliced and buttered, another the porridge, another the coffee and so to the end. As soon as the first two coaches have been supplied two more squads of waiters arrive until all are served. Within fifteen minutes every man on the train is busy with his meal.

4,000 lbs. fresh meat and bacon.
1,200 lbs. beans.
1,500 loaves of bread.
50 bags of potatoes.
1,400 lbs. of sugar.
400 lbs. of coffee.
100 lbs. of tea.
300 gals. of milk.
500 lbs. of butter.
600 lbs. of oatmeal.

Some of the staples provided for a battalion en route Camp Borden, Ontario to Halifax, Nova Scotia.

Serving over twelve hundred men in fifteen minutes without fuss or furore means organization and that is the secret of this railway's method of handling the problem. The rule is that every man shall be amply supplied and nothing delights the cook more than to see boys relish some favourite dish so well that they come back for "more." Three fine meals a day make happy interludes on the long rail journeys. The appreciation of the officers and men for the service given makes the hard work necessary in carrying out the task a pleasure to the men concerned.

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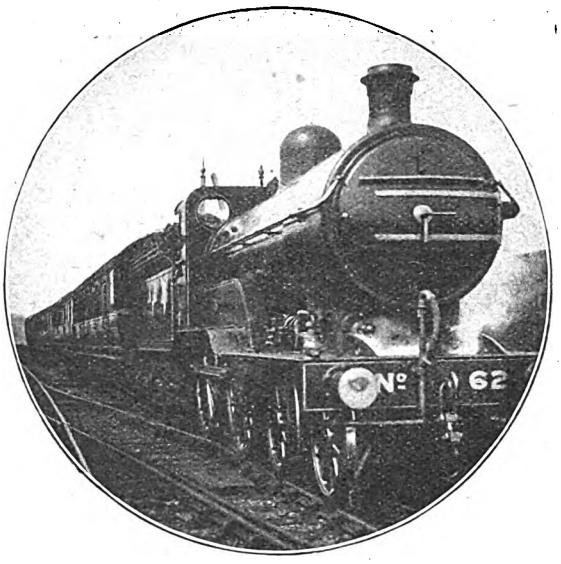
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*R. Hall.*

GREAT NORTHERN RAILWAY.
King's Cross–Cambridge express leaving Baldock.
Superheater 4–4–0 engine No. 62.

IT is many months past since we devoted attention to the railways north of the Border, and I must endeavour to repair the omission by describing a series of Scottish runs. To commence with I have tabulated a number on the "Waverley" route of the North British Railway, which has only on two previous occasions figured in these columns during the last seven years. For the majority of these I am indebted to the kindness of correspondents. Runs Nos. 2 and 10 were described some time ago, and with No. 7, which was sent me by a friend in Burmah, and dealt with in detail in October, 1915, are inserted for purposes of comparison. Of the others No. 1 was my own run, No. 9 reached me from a Rochester correspondent, and is noteworthy in that it is the first published example of the performance of one of the superheated North British "Atlantics," while the remainder are from the collection of an Edinburgh reader, now, I believe, in the distant confines of China.

As is customary, it is well in commencement briefly to recapitulate the gradients of this very laborious stretch of main line, which for its length must have few if any rivals in the British Isles for difficulty, even granting that the booked overall speeds do not greatly exceed 40 m.p.h. A good proportion of the route, indeed, was planned in the first instance as a mineral line, and when the old Hawick branch of the North British Railway was linked up with Carlisle by means of the "Border Union" line, even though the distance between Edinburgh and Carlisle was over 2 miles shorter than that of the rival Caledonian route, probably but few anticipated that express trains would be run from London to Scotland *viâ* Hawick and Galashiels. This has now been for many years a *fait accompli*, however, despite the fact that the ruling grade of 1 in 70–80 is not confined to a comparatively short stretch of line, as the 4 miles south of Shap Summit, London and North Western Railway, or the 10 miles between Beattock and Summit on the Caledonian Railway. On the contrary, the aggregate length of grades of 1 in 100 or steeper in the 98¼ miles between Edinburgh and Carlisle amounts to 36½, or 37 per cent., and of grades between 1 in 101 and 1 in 200 31 miles, or 32 per cent. Therefore all but 70 per cent. of the route is inclined at 1 in 200, or steeper.

From Carlisle the line is fairly level for over 13 miles, although owning several sharp undulations, up to 1 in 100, none of which, however, exceed ½ to ⅝-mile long. At a distance of 13¼ miles from Carlisle Penton bank begins, continuing for nearly 3¾ miles at 1 in 100 past Riddings and Penton stations. Undulations, sharp and short as before, follow from about the 17th mile on to Newcastleton, where the southern ascent to Whitrope Summit commences. The first stage of this climb consists of 1¼ miles at 1 in 200–125; then follows Steele Road bank proper, with 8¾ miles continuously at 1 in 75,

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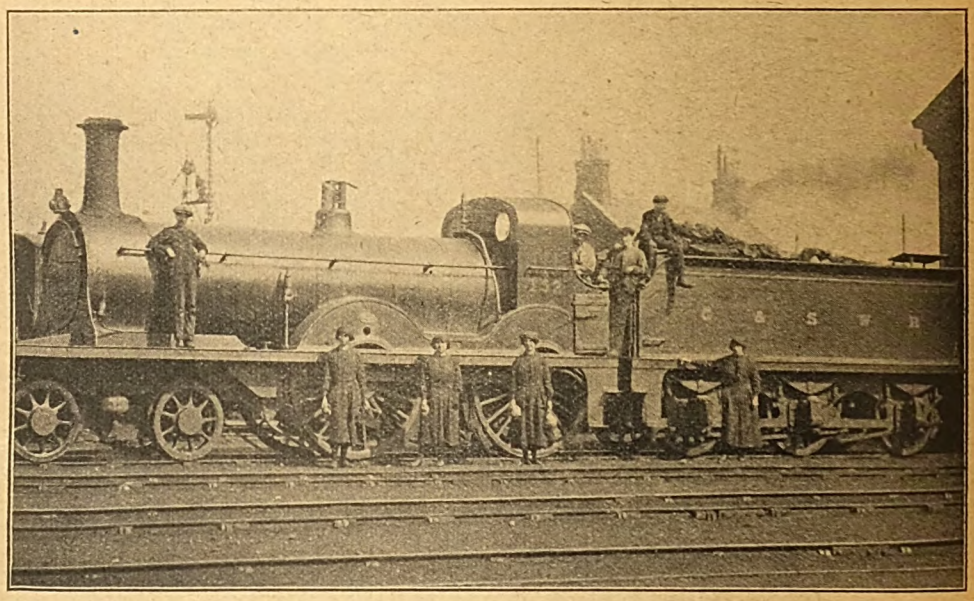
and a concluding length of 1½ miles at 1 in 80–90 to the summit—a wild spot in the western spurs of the Cheviots, 880 ft. above the sea. In all the climb therefore totals 11½ miles in length, and it is succeeded by a fall of all but 10 miles into the valley of the Teviot at Hawick, not quite so steep in character. The latter commences with ¾-mile at 1 in 96 and 3 at 1 in 75, to Shankend, flattens thence to 1 in 121–117 for 1½ miles, but then steepens again to 1 in 80 for 2¼ miles to beyond Stobs, and concludes with 2½ miles at 1 in 77–123–112–72–75 to Hawick, the southward start from the last-mentioned town being particularly awkward.



GLASGOW AND SOUTH WESTERN RAILWAY.

Smellie 4-4-0 engine No. 152A at Greenock.
Showing women engine cleaners now engaged.

Across from the Teviot valley to that of the Tweed at Galashiels is easy by comparison, although by no means level. From Hawick there is a rise of 6 miles at 1 in 150 (2 miles), 175 and 200, broken only by 1½ miles level or downhill to Standhill Summit. From Standhill to St. Boswell's there is a substantial fall, commencing with 2¼ miles at 1 in 120–150, and continuing, after ½ mile up at 1 in 120, with ¾ at 1 in 120, ½ level, and another ¾ at 1 in 245. Thence to Galashiels there are undulations, fairly sharp, Galashiels station being situated actually on the beginning of the second climb, of 15¾ miles, to Falahill Summit, 900 ft. above the sea, where the line crosses the ridge connecting the Moorfoot and the Lammermuir Hills. The length of this climb renders it less steep than those preceding it, although still decidedly arduous for heavily-laden engines. First there come 4½ miles at 1 in 120 (on which Galashiels is situated)–110–155–99, fairly equally divided, then 2½ at 1 in 175 to Stow station, which stands on ½-mile of level track; after that follow 1¼ miles at 1 in 200, ½ level, and 4¼ at 1 in 150 (including two short level strips), while the final ascent consists of 1¼ miles at 1 in 100, and 1 at 1 in 132. But from Falahill northwards is the steepest drop of the whole route, beginning as it does with 1¼ miles at 1 in 100, and continuing with 8 miles almost unbrokenly at 1 in 70 to Hardengreen Junction, Eskbank. Thence there are 3¼ falling miles at 1 in 228–250–218–175, ⅞ level to Niddrie South Junction, and ⅞ falling at 1 in 100–80 to the junction with the East Coast Route at Portobello. A final "pull" of a mile up at 1 in 78 from St. Margaret's, and we land in the Waverley station at Edinburgh, after what must be admitted as an extraordinarily strenuous journey from Carlisle, 98¼ miles distant.

The working times are carefully arranged in relation to the intermediate grading, and,

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as will be evident, approximate fairly closely to average running. Uphill times are generous, but by no means too much so. Those of 22 and 23 min. for the 10·3 miles from Newcastleton to Whitrope work out at an average of 28·1 and 26·9 m.p.h. respectively, while the covering of the 15·5 miles are usually made at both places, and the recovery from the former is steeply uphill to Standhill. On the long downhill sections the line winds so constantly that high speed is altogether inadvisable, and as a result the mile-a-minute rate is seldom exceeded, while the average speeds are considerably lower

NORTH BRITISH RAILWAY: CARLISLE–EDINBURGH.

Run No.			1	2	3	4	5			6	
Train ex-Carlisle			1.30 a.m.		3.55 p.m.		4.28 a.m.			8.2 p.m.	
Distance.	Engine No. / Engine Name / Type / Total load (tons)		Schedule.	766 — ¶4-4-0 235	878 *Hazeldean.* 4-4-2 240	895 *Rob Roy* 4-4-0 120	400 *The Dougal Cratur* †4-4-0 120	Distance.	Schedule.	902 *Highland Chief* 4-4-2 ‡220	Schedule.	901 *Saint Johnstoun* 4-4-2 §110
Miles			M.	M. S.	M. S.	M. S.	M. S.	Miles	M.	M. S.	M.	M. S.
0·0	Carlisle	dep.	0	0.00	0.00	0.00	0.00	0·0	0	0.00	0	0.00
4·4	Harker	pass	—	7.45	7.30	6.58	6.47	4·4	—	7.13	—	6.42
9·6	Longtown	,,	13	12.45	12.30	12.03	12.03	9·6	13	12.16	13	11.58
14·0	Riddings	arr.		pass	pass	pass	pass	—	—	pass	19	18.00
		dep.	—	17.45	17.30	17.00	17.04	14·0	—	17.30	20	19.00
16·6	Penton	,,	22	22.00	21.45	20.32	20.35	16·6	22	21.31	25	24.15
24·2	Newcastleton	arr.	pass	††31.30	pass	pass	pass	—	pass	pass	pass	pass
		dep.	32	34.00	32.00	29.01	29.33	24·2	32	30.55	35	32.40
28·8	Steele Road	pass	—	45.15	40.30	36.21	36.44	28·8	—	39.09	—	39.00
32·3	Riccarton Junc.	,,	50	52.15	47.30	42.55	43.21	32·3	50	48.10	48	45.05
34·5	Whitrope Summit	,,	54	55.45	51.30	46.07	47.14	34·5	55	53.40	52	48.35
38·3	Shankend	,,	—	60.15	56.30	52.07	51.43	38·3	—	58.05	—	53.05
45·3	Hawick	arr.	pass	pass	pass	pass	*60.15	45·3	68	66.45	66	61.10
		dep.	67	68.00	65.15	61.30	61.30	0·0	0	0.00	0	0.00
53·0	Belses	pass	—	77.45	75.30	71.42	72.15	7·7	—	11.37	—	10.20
57·6	St. Boswell's	,,	81	82.15	80.15	76.57	76.50	12·3	18	16.25	16	15.00
61·0	Melrose	,,	—	85.45	83.45	80.52	80.25	3·4	—	—	6	5.55
64·7	Galashiels	,,	89	89.45	88.00	85.26	84.13	7·1	11	10.40	6	6.05
68·4	Bowland	,,	—	96.15	94.00	92.11	90.02	3·7	—	7.41	—	7.15
71·5	Stow	,,	—	101.00	98.15	96.42	93.59	6·8	—	11.52	—	11.40
75·6	Fountainhall	,,	—	106.15	103.15	102.26	98.45	10·9	—	17.02	—	17.15
80·2	Falahill	,,	113	114.15	109.45	109.05	104.30 *b*	15·5	26	24.02	25	24.45
86·2	Gorebridge	,,	—	121.00	116.15	115.30	113.05	21·5	—	30.39	—	31.15
90·2	Eskbank	,,	124	124.30	121.00	120.12	117.29	25·5	37	35.02	36	35.38
95·2	Portobello	,,	130	131.15	127.45	126.11	123.11 *c*	30·5	43	41.05	43	41.15
98·2	Edinburgh	arr.	135	143.00 *a*	133.45	130.45	128.30	33·5	48	45.50	48	46.00
98·2	Net time (min.)		135	135	133¾	130¾	123	98·2	‖145	‖139¾	‖141	‖133¼

† Superheater engine. ‡ 210 tons from Galashiels. § 240 tons from Galashiels. ¶ Medium-boilered (Holmes) type. * Special stop. *a* Sigs., dead stand, Portobello West. *b* Sigs., very severe, Fushiebridge and Gorebridge. †† Stop for bank engine. *c* P.W. check, severe. ‖ Actual running time, including starting and stopping in each case.
Thick horizontal line indicates stop.

from Galashiels to Falahill in 24 min. means an average of 38·8 m.p.h. Against this 32 min. allowance from Carlisle out to Newcastleton, including the ascent of Penton bank, is not to be despised, while the time of 22 min. for the 19·6 miles from Hawick to Galashiels is really smart, as severe slacks than this figure. This is evident in such times as 13 min. for the 9·6 miles from Whitrope down to Hawick, or 17 min. from Falahill to Portobello, 15 miles. I believe it is correct that the locomotive authorities of the North British Railway chose the "Atlantic" in preference to the 4–6–0 type

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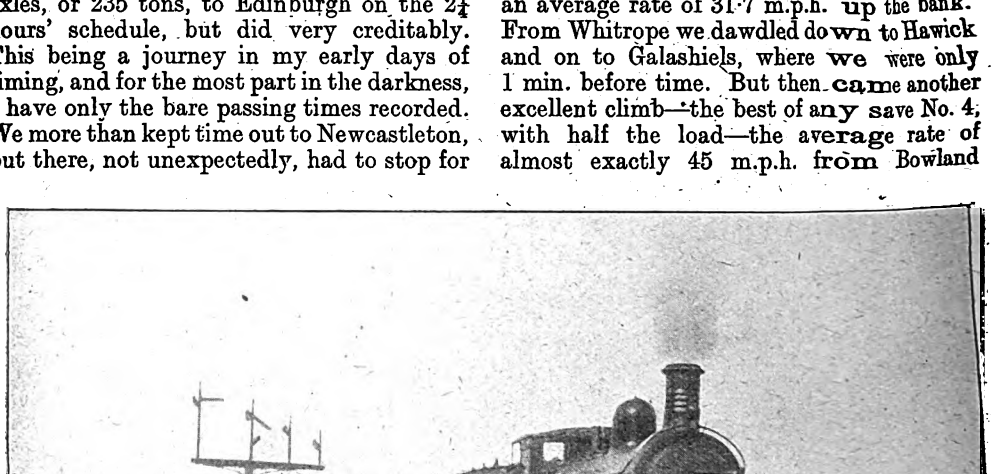
—which would seem the more naturally suited to such terrific gradients—in view of the bad alignment of the "Waverley" route, and also of the Northern main line from Edinburgh, which rendered the utmost possible flexibility of wheelbase desirable.

On No. 1 run No. 766, of the last 4–4–0 class designed by Mr. Matthew Holmes, had a fairly stiff proposition to face in taking 36 axles, or 235 tons, to Edinburgh on the 2¼ hours' schedule, but did very creditably. This being a journey in my early days of timing, and for the most part in the darkness, I have only the bare passing times recorded. We more than kept time out to Newcastleton, but there, not unexpectedly, had to stop for the assistance of a bank engine. Thence, although starting from rest, we did excellently to gain ¼ min. on schedule to Whitrope, and were only a minute late through Hawick, despite 2½ min. spent standing at Newcastleton. Good time also was effected from Hawick to Galashiels—19·4 miles in 21¾ min.—and through the latter place a careful and severe check was made. The Galashiels–Falahill ascent was tackled without pilot assistance, a loss of only ½ min. on booked time being occasioned, and but for a severe check through Portobello, culminating in a dead stand at the West box, we should probably have been in punctually.

Hazeldean's work on the same train, in column 2, with an almost identical load of 36 axles, was very good, and the excellence of the climbing was such that time might have been gained considerably had not the downhill running been so sluggish. The "Atlantic" started slightly faster than the 4–4–0 in run 1, as far as Penton, took matters easily thence to Newcastleton, but then went well up to Whitrope, gaining 2½ min. in virtue of an average rate of 31·7 m.p.h. up the bank. From Whitrope we dawdled down to Hawick and on to Galashiels, where we were only 1 min. before time. But then came another excellent climb—the best of any save No. 4, with half the load—the average rate of almost exactly 45 m.p.h. from Bowland (after recovering from Galashiels slack) to Falahill being very fine. Thus at the summit we were 3¼ min. early, but sluggish downhill running again contrived to reduce the gain to 1¼ min. on arrival at Edinburgh. By keeping the downhill times of the schedule from Whitrope to St. Boswell's, and Falahill to Waverley, we should have made the run in exactly 130 min.

Next come a couple of runs with 4–4–0 engines on the 3.55 p.m. non-stop express from Carlisle—also a 2¼ hours' train—behind the larger 4–4–0 engines of Mr. W. P. Reid's design. This train, consisting of the Edinburgh portion of the late 9.30 a.m. ex St. Pancras, has been normally light in



Photo] [Tom M. L. Neish.

HIGHLAND RAILWAY.
Train from Grantown-on-Spey to Perth leaving Aviemore.
4–4–0 locomotive No. 128, *Loch Luichart*.

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formation for the great part of the year, being made up generally to three 8-wheelers and a 12-wheeled composite restaurant car, attached at Carlisle. With so light a load as 120 tons (18 axles), *Rob Roy* got away very smartly from Carlisle, gaining 3 min. to Newcastleton and nearly 8 min. to Whitrope by a rapid ascent of the bank, averaging 36·1 m.p.h. between the two last-mentioned points. But the subsequent running was leisurely to a degree, time being dropped on most sections save for a slight gain between Galashiels and Edinburgh, due principally to a very quick finish from Portobello. The final gain on schedule was one of 4¼ min.

Superheater engine No. 400, *The Dougal Cratur*, tied closely with *Rob Roy's* times to Penton, but did not do quite so well up to Whitrope, although the gain on time at the latter point aggregated 6¾ min., and was maintained at the same figure to Hawick, where a special stop was made. On re-starting some first-class work was performed, the times from Hawick start to Galashiels, 19·4 miles in 22 min. 43 sec., and from Galashiels up to Falahill, 15·5 miles in 20 min. 17 sec., both being exceptionally good. The latter time involved an average speed up this steep ascent of 45·8 m.p.h. Consequently, inclusive of the delays north of Falahill, the 52·9 miles from Hawick to Edinburgh were covered in 67 min., or in 64½ min. net, start-to-stop, at an average of 49·2 m.p.h. Even allowing only 3 min. for the stop at Hawick, which included 1¼ min. actually standing, the net time from Carlisle to Edinburgh was 12 min. under schedule, and I do not doubt that the run could have been made in the even 2 hours, had occasion required. Inclusive of stop and delays, 6½ min. were gained on schedule time.

The last two runs were made on trains having regular intermediate stops, the 4.28 a.m. *ex*-Carlisle (in continuation of the 9.30 p.m. *ex*-St. Pancras) calling at Hawick, St. Boswell's and Galashiels, and the 8.2 p.m. (carrying the Edinburgh portion of the 1.30 p.m. *ex*-St. Pancras) calling at the same stations, with Riddings and Melrose in addition. In the former case the standard timings are in use, but the latter train, which usually loads very lightly from Carlisle to Galashiels, is timed much more rapidly on this stage, being allowed 5 min. less than the non-stop trains from Newcastleton up to Whitrope, as also 2 min. less from Hawick to Galashiels, and 1 min. less from Galashiels to Falahill, than the 4.28 a.m. down. On run No. 5 *Highland Chief* did quite decently, without, however, achieving any times of very special note. The start from Carlisle to Newcastleton was good, but the ascent of Steele Road bank was leisurely, although 1¼ min. were gained to Hawick. Thence smart runs were made between Hawick and St. Boswell's, and St. Boswell's and Galashiels respectively, and the climb from the last-mentioned town to Falahill was distinctly good, 2 min. being gained, while the same gain was maintained into Waverley. The aggregate gains to engine were thus 5¼ min.

It is unusual to find an "Atlantic" on the evening express from Carlisle, and *St. Johnstoun* made light work of the feather-weight load on the first stages of the run. Some remarkable times were made, in particular from Riddings up to Whitrope, inclusive of both Penton and Steele Road banks, thus 20½ miles' length occupying only 29 min. 35 sec. So over 4¾ min. were gained from Carlisle to Hawick, and had no stop been made at Riddings, the running times were equivalent to a non-stop journey in 58 min. Very smart work, again, was seen in the short run from Hawick to St. Boswell's, including the initial climb to Standhill —12·3 miles in 15 min., start-to-stop. After leaving Galashiels little more of note was recorded than a good start to Bowland, and a fast finish from Falahill into Edinburgh—18 miles in 21¼ min.—resulting in a further gain of 2 min. The driver on this occasion, therefore, had a total economy on schedule of 7¾ min. to his credit, all stops included.

South-bound schedules have the same characteristics as those operating in the opposite direction. An average time of 21 min. is allowed for the steep ascent from Eskbank (Hardengreen Junction) to Falahill, although the 9.30 a.m., on its summer non-stop schedule, is only allowed 20 min., equivalent to 30 m.p.h. Similarly from Hawick up to Whitrope, 10·8 miles, the allowance is 25 min. from starting to passing the summit, and 22 min. from passing to passing. Run 7 was made on the non-stop summer schedule of the 9.30 a.m. *ex*-Waverley, allowed the "crack" time over this route of 131 min., but runs 8 and 9 were made in the winter times, and include the generally observed conditional stops at Galashiels and Hawick. For these the working time-book allows 3 min. each, so that together with 3 additional min. in the running time, the train has 9 min. more to Carlisle as compared with the summer 9.30 a.m. These stops being conditional the times in my table are continued through to

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Carlisle, inclusive of the period of each stoppage. In column 12 it should be noted that two entirely different runs are given, although on the same train.

Run No. 7, behind *Jeanie Deans*, was a remarkable effort, more especially as the conditions were bad, by reason of a fine rain and a strong west wind, while the start was very discouraging, with a dead stand for nearly 4 min. at Niddrie South Junction. On re-starting, speed fell to 28½ m.p.h. on the first 3 miles at 1 in 70, and to 27½ on the second, although recovering up the same unbroken grade, rather surprisingly, to 32½ at the summit. So the 9 miles from Newton-grange to Falahill occupied 16 min., 55 sec. in all. Then followed a gentle run down to Galashiels, with frequent brake applications, as is general on these inclines, Galashiels itself being passed at 25 m.p.h. From here

NORTH BRITISH RAILWAY: EDINBURGH—CARLISLE.

Run No.		7	8	9	10			11		12
Train		9.30 a.m. (Summer)	9.30 a.m. (Winter)		10.30 a.m.			10.0 p.m.		
Distance.	Engine No. / Engine Name / Engine type / Total load (tons)	Schedule. 899 *Jeanie Deans.* 4-4-0 170	Schedule. 875 *Mid-lothian* 4-4-2 120	— *Aber-donian* †4-4-2 170	Distance.	Schedule.	869 *Abbots-ford* 4-4-2 275	Schedule.	902 *High-land Chief* 4-4-2 225	906 *Tere-bus* 4-4-2 265
Miles		M. M. S.	M. M. S.	M. M. S.	Miles	M.	M. S.	M.	M. S.	M. S.
0·0	Edinburgh .. dep.	0 0.00	0 0.00	0.00	0·0	0	0.00 *d*	0	0.00	0.00
3·0	Portobello .. pass	5 4.55 *a*	5 4.23 *b*	5.35 *c*	3·0	5	7.00	5	4.30	4.30
8·0	Eskbank .. „	12 —	12 12.00	13.25	8·0	12	¶15.00	12	11.15	11.05
12·0	Gorebridge .. „	— 24.05	— 18.15	19.40	12·0	—	25.30	—	18.20	17.37
18·0	Falahill Summit (arr.	pass pass	pass pass	pass	18·0	pass	37.30	pass	pass	‖29.35
	(dep.	32 35.35	33 28.34	32.50	—	33	¶38.15	33	31.44	31.20
22·6	Fountainhall „	— 40.45	— 33.55	38.10	22·6	—	44.15	—	37.05	37.45
29·8	Bowland .. „	— 48.05	— 41.36 *c*	45.50	29·8	—	51.30	—	44.49 *c*	45.02
33·5	Galashiels (arr.	pass pass	* 46.25	50.00	33·5	51	55.45	51	50.00	49.15
	(dep.	49 52.15	51 48.30	51.30	0·0	0	0.00	0	0.00	
37·2	Melrose .. pass	— 56.50	— 53.23	56.40	3·7	6	6.00	6	6.00	
40·6	St. Boswell's .. „	57 60.40	60 57.01	60.20	3·4	7	6.45	6	6.15	874 *Dun-edin*
45·2	Belses .. „	— 66.30 *g*	— 62.02	65.40	8·0	—	7.30	—	11.42	4-4-2 165 tons
52·9	Hawick (arr.	pass pass	* 71.05	73.10	6·7	17	17.00	22	20.40	
	(dep.	70 75.10	75 74.35	76.00	0·0	0	‡0.00	0	0.00	0.00
56·7	Stobs .. pass	— 81.45	— 83.34	85.30	3·8	—	8.00	—	—	8.45
59·9	Shankend .. „	— 87.00	— 89.05	91.00	7·0	—	13.30	—	16.35	13.40
63·7	Whitrope Summit „	92 93.55	100 95.56	98.00	10·8	25	‡20.30	25	24.30	22.40
65·9	Riccarton Junc. „	95 96.35	104 100.03	100.40	13·0	29	23.00	29	27.30	25.30
74·0	Newcastleton „	104 105.40	113 109.17	109.45	21·1	38	32.30	38	36.20	34.38
81·6	Penton .. „	112 113.25	121 118.25	117.15	28·7	47	40.30	46	—	41.54
84·2	Riddings .. „	— 116.15	— 121.24	120.00 *f*	31·3	—	43.15	—	—	44.38
88·6	Longtown .. „	120 120.45	129 126.20	125.35	35·7	54	47.45	53	—	48.50
93·8	Harker .. „	— 126.05	— 131.41	130.45	40·9	—	53.00	—	—	54.10
98·2	Carlisle .. arr.	131 132.25	140 138.05	137.05	45·3	65	59.15	64	63.45	61.00
98·2	Net times (min.) ..	131 124½	— §131	§130	98·2	146	143	143	139½	—

† Superheater engine. ‖ Piloted to Falahill by No. 321, 4-4-0. ¶ Stops to attach and detach bank engine. ‡ Banked in rear Hawick to Whitrope. * Conditional stops: 6 min. extra allowed in timing. *a* Sig. check and stop, Niddrie South, 3 min. 55 sec. *b* P.W.R. check. *c* Sigs., outside Galashiels. *d* Two severe signal checks. *e* Sigs., Niddrie North, and p.w.r. check beyond. *f* P.W.R. check, Scotch Dyke. *g* Two slight signal checks. § Net actual running time (including starting and stopping twice).

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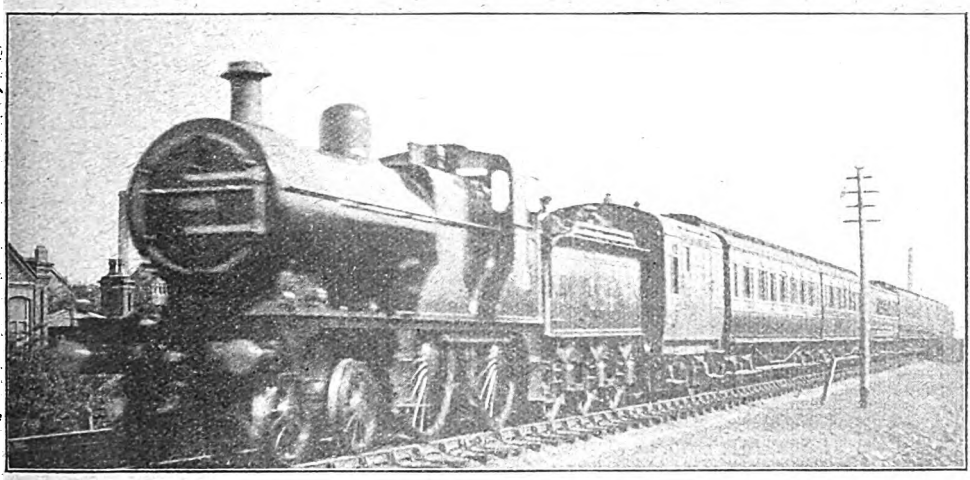
along to Hawick the wind was very badly felt, although good climbing was involved in the maintenance of a 53 m.p.h. average from St. Boswell's up to Standhill. After that signal checks ensued, and nearly 2 min. were lost between Galashiels and Hawick, which was passed at 30 m.p.h. But ample amends were made by an excellent climb to Whitrope, the lowest speed on the 1 in 75 being 32·3 m.p.h., while the total time of ascent was 18¾ min. for the 10·8 miles, or 3¼ min. under schedule. A very cautious descent followed, with many brake applications (as severe as 20 m.p.h. at Riccarton Junction), and the final arrival at Carlisle was nearly 1½ min. behind time, although the net time showed an economy of 6½ min. on schedule.

Galashiels to Hawick, 19·4 miles, covered in 22 min. 35 sec., start-to-stop. *Aberdonian*, the superheated "Atlantic," was not so speedy up to Falahill, although the load was heavier. But the driver did well, after the Niddrie check, to accelerate to 53 m.p.h. up the 3½ miles at 1 in 175–218–250–228 to Eskbank. Thereafter the lowest speed on the 1 in 70 was 23½ m.p.h., and with very cautious downhill running the net time to Galashiels was 48 min. Then followed a very smart little run to Hawick, this distance being covered in 21 min. 40 sec., at an average speed of 53·7 m.p.h. The lowest speed at Standhill was 53 m.p.h., and the highest beyond 65 m.p.h. Re-starting from Hawick, *Aberdonian* was doing 32½ m.p.h. at Stobs, 40½ at Shankend (after 1½ miles



Photo] [*A. Conville.*

MIDLAND RAILWAY.
Liverpool, Manchester and Scottish express near Wilpshire.
4–4–0 engine No. 384.

Midlothian had an easy task on run 8, and gained time substantially on all the uphill stretches. This was particularly the case from Eskbank to Falahill, between which points a time of 16 min. 34 sec. meant a gain of nearly 4½ min. on schedule, while in covering the 10·8 miles from Hawick up to Whitrope in 21 min. 21 sec. over 3½ min. were gained also. But the downhill speeds were excessively moderate, over 2 min. being lost between Whitrope and Carlisle from this cause. A feature of this journey was seen in some very smart starts, in particular those from Edinburgh to Portobello, 3 miles in 4 min. 23 sec., and Galashiels to Melrose, 3·7 miles in 4 min. 53 sec. The latter commenced a smart run from

at 1 in 117–121) and then fell to exactly 30 at Whitrope, thus gaining 3 min. on schedule from Hawick. After that the downhill speeds, although a little faster than those of the preceding run, were still moderate, not exceeding 65 m.p.h. anywhere, and Carlisle was reached 3 min. before time.

The heaviest load of all was that taken by *Abbotsford* on run 10, with the popular 10.30 a.m. express *ex*-Waverley. As this amounted to 9 bogies and a 12-wheeled "diner," or 42 axles in all, the statutory unpiloted maximum was exceeded, and it was therefore necessary to stop at Eskbank for bank engine assistance. With this aid the climb of 10 miles was achieved in

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21½ min., start-to-stop, and it is also worthy of note that the joint operations of attaching and detaching the "banker" were carried out in the remarkably short time of 1¾ min. Re-starting, we covered the 15·5 miles from Falahill down to Galashiels, start-to-stop, in 17½ min. The short runs between Galashiels, Melrose, St. Boswell's and Hawick were all made in about the schedule time, and then again we attached a bank engine in rear for the climb to Whitrope, which was accomplished in the fine time of 20½ min. from the start—quite the fastest ascent of the series. A little further time was gained to Carlisle, with the result that the journey was completed from Hawick in ¾ min. under the hour, or 5¾ min. under schedule.

Of the remaining runs but little need be said. *Highland Chief*, on the 10.0 p.m. *ex*-Waverley (Column 11.) put up a steady performance, gaining time slightly on every section, save that from Newcastleton to Carlisle, where the sluggish running apparently encouraged my correspondent to take some well-earned repose, as the intermediate times are lacking from his "log." *Terebus* (Run 12) was piloted up to Falahill, but with some smart detaching work at the summit still contrived to reach Galashiels 1¾ min. before time. On the subsequent run in the same column *Dunedin* had a much lighter load, and contrived without difficulty to gain 3 min. between Hawick and Carlisle. My correspondent also sent details of another short run, between Edinburgh and Galashiels, on the 2.35 p.m. train, allowed 51 min. for the non-stop run. On this occasion the 4–4–0 superheater engine No. 400, *The Dougal Cratur*, had a load of 180 tons, and, after passing Portobello in 4 min. 35 sec., was through Eskbank in 11½ min. (despite a p.w. check at Niddrie), and breasted Falahill Summit in 31 min. 5 sec. from the start. With a quick run down to Galashiels the journey was completed in 47 min. 35 sec., or 46½ min. net. It is therefore evident, from this collection of runs, that good work is done and excellent time kept, on the "Waverley" route of the North British Railway. Indeed, from continued personal observations at Carlisle, I should be inclined to put the average punctuality of the North British services as high as, if not higher than, that of any other of the companies entering the Citadel station.

Before leaving the North British Railway I might mention a run that I had northward from Edinburgh many years ago on the second portion of the 4.10 a.m. *ex*-Waverley, on which some very decent running was performed by an engine of the penultimate Holmes 4–4–0 batch. I have no record of the number of the engine, but the load was one of eight 8-wheelers, or 210 tons in all. Starting smartly, we were through Dalmeny, 9·5 miles, in 12½ min., Inverkeithing, 13·2 miles, in 17 min., and Burntisland, 20·1 miles, in 25½ min., despite the hindrances occasioned by the 40 m.p.h. speed restriction over the Forth bridge, and the 2½ miles up at 1 in 94 east of Inverkeithing. We slacked to 20 m.p.h. through Burntisland, and also to 10 m.p.h. for repairs to the viaduct at Kirkcaldy, the 5·7 miles between these places taking 8¾ min., and the 4·8 miles thence to Thornton Junction 6¾ min., while the 5·5 miles from Thornton to Falkland Road occupied 8 min. From Burntisland to Falkland Road is mainly a rising stretch, and includes 6 adverse miles at 1 in 102–136.

After that the 2·9 downhill miles from Falkland Road to Ladybank Junction were covered in 3¼ min., the 5·5 miles from Ladybank to Cupar in 5¾ min., and the 6·3 miles thence to Leuchars Junction in 6¼ min.—total 14·7 miles in 15¼ min., mainly on falling grades. An easy run from Leuchars took us over the Tay Bridge into Dundee, 8·4 miles in 11¼ min., the total run of 59·2 miles from Edinburgh, over a very difficult route, having been accomplished in 75½ min., or 4 min. under schedule time. Thence onward to Arbroath we ran smartly, passing Broughty Ferry, 4 miles, in 6¾ min., and Carnoustie, 10·9 miles, in 14 min., Arbroath, 17 miles, was reached in 21 min., start-to-stop, or 2 min. under the booked allowance. After that delays were so severe that further timing was useless.

Returning southwards from Aberdeen in more recent years by the Caledonian 10.5 a.m. train, we had a load of three 6-wheelers, three 8-wheelers and three 12-wheelers, total 39 axles, or 250 tons behind the tender of No. 140, a McIntosh 4–4–0 of the last and largest batch prior to the superheater engines. Starting on time, we climbed the 8·2 miles to Portlethen (nearly 5¼ of which are inclined at 1 in 96–164) in 14½ min., and covered the 8 miles thence to Stonehaven, mostly downhill, in 8 min. 5 sec., touching 64 m.p.h. From Stonehaven we ran the 7·1 miles up to Drumlithie (3¼ at 1 in 85–143) in 10 min. 55 sec., and did some fast running on to Laurencekirk, the 7·3 miles taking 7 min., with a maximum of 69 m.p.h. Beyond Marykirk we were very badly checked by signals, so that the 8·6 miles

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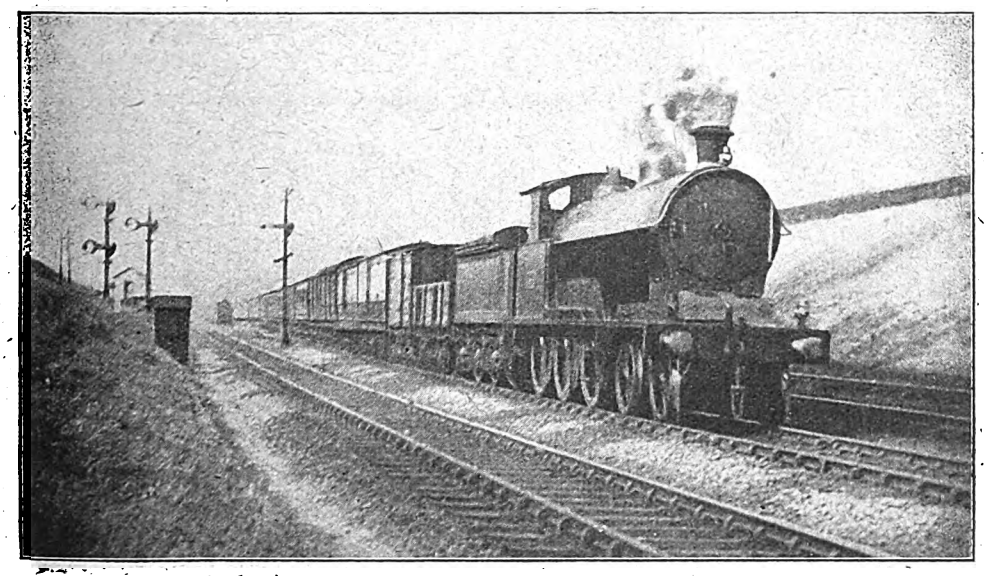
from Laurencekirk to Dubton Junction stop occupied 14 min. Otherwise the 39·2 miles from Aberdeen to Dubton would have been covered in not more than 50 min. (the actual time was 54½ min.), against a booking of 58 min., although the latter includes conditional stops at Stonehaven and Laurencekirk which we did not make.

On re-starting we did not cover the 2·7 miles to Bridge of Dun in the somewhat optimistic 3 min. of the working time-book—with all allowance for the favourable nature of the start—but took 4¾ min., and then spent 11 min. 20 sec. on the ensuing 8·2 miles to Guthrie Junction, speed falling to 34½ m.p.h. on Farnell Road bank (3⅝ miles at 1 in 96–143). We were badly checked by signals at Guthrie and outside Forfar, so that the 18·1 miles from Dubton to Forfar took 27¼ min., instead of the 25 min. scheduled, but not over 24 min. net. But the Forfar–Perth run was disappointing. Despite the fact that the road is slightly in favour of the engine throughout, we took 5 min. 50 sec. to pass Kirriemuir Junction, 2·9 miles; 15 min. 5 sec. to Alyth Junction, 12 miles; 19¾ min. to Coupar Angus, 16·7 miles; 28 min. 50 sec. to Stanley Junction, 25·3 miles; and 37 min. 5 sec. to Perth stop, a run of 32·5 miles. The highest speeds were 65 m.p.h. at Eassie and again at the Tay bridge, beyond Cargill, and 67 m.p.h. on Strathord bank, but by shutting off steam here the driver lost any chance he might have had of regaining a little time on the 34 min schedule.

South of Perth the run lost most of its interest in view of the lightness of the load and the easy timing, and also the fact that we were piloted as far as Stirling. But a run on another occasion on the up evening "Grampian Corridor" from Perth to Glasgow (Central) was decidedly more entertaining. The load consisted of seven 12-wheelers and an 8-wheeler, total 46 axles, or 305 tons, and the engine was a "Dunalastair" of the second batch—No. 768—an "infant" in appearance amongst the giant 4–4–0's and 4–6–0's of more recent construction. But the little engine did remarkably well. From Perth, beyond the brief 1-mile rise to Moncreiffe Tunnel, southbound trains have a level start, and thus we passed Forgandenny, 3·9 miles, in 7 min. 35 sec., and Dunning, 9·6 miles, in 14 min. 5 sec., speed rising to 55 m.p.h., just beyond Forgandenny. Just before Dunning commences the arduous 7 miles' ascent to Gleneagles, commencing with 3 miles mainly at 1 in 121, and continuing with 4 miles at 1 in 89–107. On the first-mentioned stretch our speed fell to 36 m.p.h., and on the second to 26½ m.p.h.—no mean climbing achievement, load and locomotive



Photo] [*A. Conville.*

LONDON AND NORTH WESTERN RAILWAY.
Mixed train near Leyland. 4–6–0 locomotive, *City of Dublin.*

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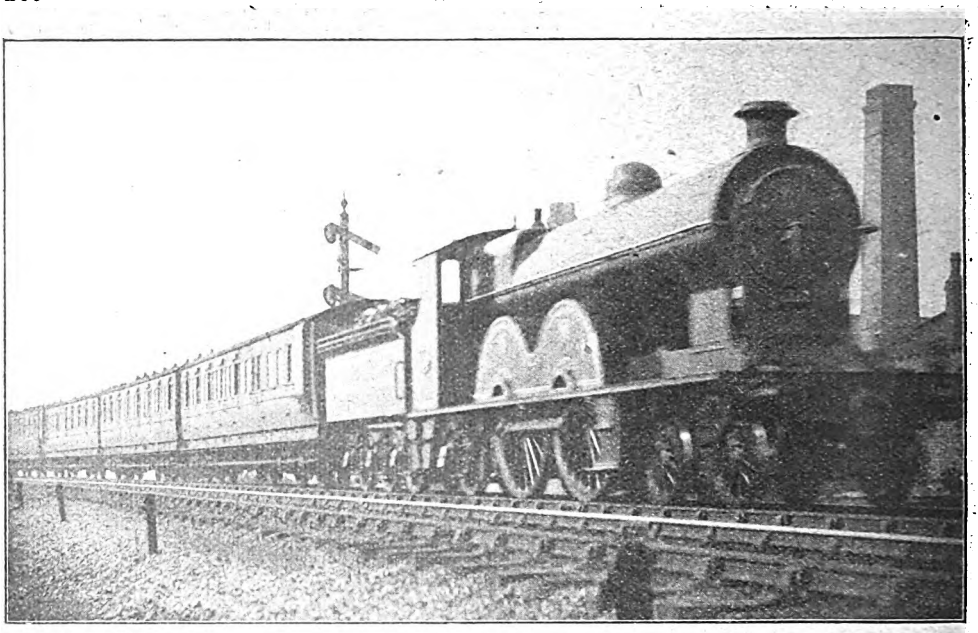

Photo] [*A. Conville.*

LANCASHIRE AND YORKSHIRE RAILWAY.

Manchester–Skipton express. Atlantic locomotive No. 1417.

considered. So the 6·2 miles from Dunning up to Gleneagles occupied 11¼ min., and the 2·2 miles thence to Blackford 3¾ min. The 7·4 easy miles from Blackford to Kinbuck occupied 7 min. 25 sec., with a maximum of 66 m.p.h., while Dunblane bank was descended with great caution, speed at one point being reduced to 35 m.p.h., and the time from Kinbuck to Stirling, passed at 40 m.p.h., being no less than 8 min. 55 sec. for the 7·6 miles. But we were through Stirling, 33 miles, in 45 min. 25 sec., or more than 3½ min. under schedule time.

At Polmaise, however, we suffered a very bad permanent way check, with another beyond Larbert, hampering the ascents to Plean and Greenhill respectively. So speed fell to 31½ m.p.h. on the former (2 miles, mostly 1 in 118) and to 27 m.p.h. on the latter (2 miles at 1 in 93–112), the intervening maximum at Alloa Junction being 64 m.p.h. The 8 miles from Stirling to Larbert took 12 min. 5 sec., and the 3·6 miles from Larbert to Greenhill 6 min. 50 sec. After Greenhill the brief descent raised the speed to 50 m.p.h., and we then went up the ¾ mile at 1 in 98, and 2¼ at 1 in 128 to Cumbernauld at a sustained 37½ m.p.h.—a very fine performance—so covering the 5·4 miles from Greenhill to Cumbernauld in 8 min. The next 6·5 miles to Coatbridge took 8 min. 5 sec., with a maximum of 60 m.p.h., our total time from Perth, 56·5 miles, being now 80 min. 25 sec., or 76 min. net; schedule time is 81 min. After Coatbridge we were sorely delayed, being stopped dead at Langloan for 2 min., and slacked by signal at Mount Vernon, Carmyle and Eglinton Street, so that the final 11·2 miles occupied no less than 24 min. 35 sec. Even then we had taken exactly the allowed public time of 105 min. from Perth, but the working time is, of course 101 min. (7.47 p.m. depart, 9.28 p.m. arrive). Our net time, however, was something like 95 min., so that allowing duly for the tremendous difficulties of the route, No. 768 had acquitted herself very creditably.

As we have now reached Glasgow, it is fitting that the present article should conclude with the description of a couple of runs southward from Glasgow to Carlisle, made during the course of last two years. Owing to the wartime congestion on the southern extremity of the Caledonian system, delays are almost inevitable, and most of my recent runs were spoiled at various points from this cause, but the two about to be described fared better than the general average. Both were on the 10.0 a.m. from Glasgow to London, subsequent to the date when the practice recommenced of combining the

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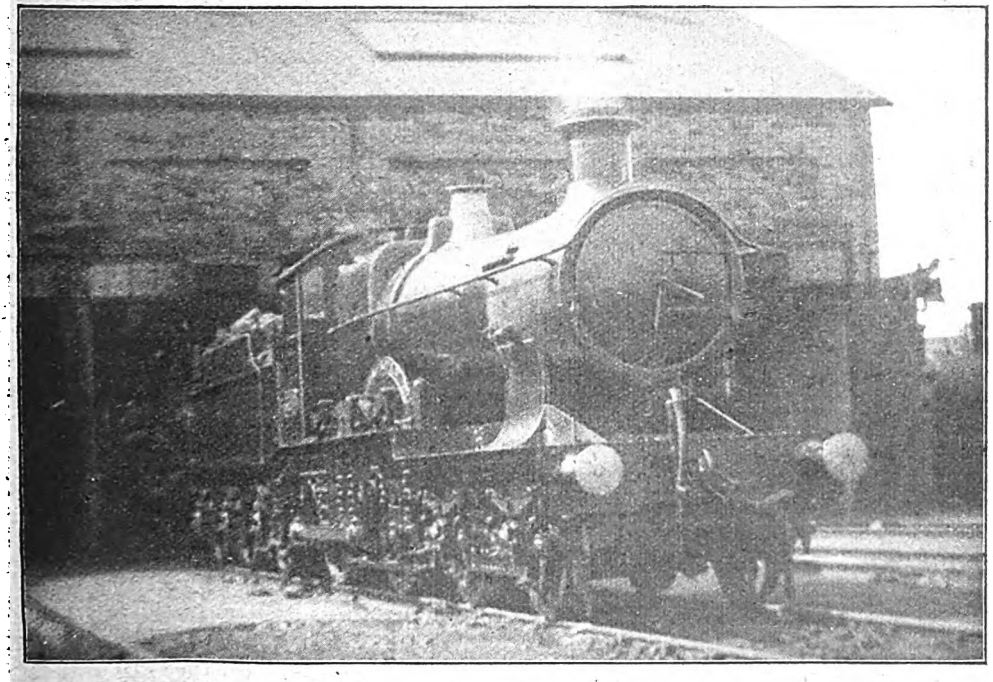
Glasgow and Edinburgh portions at Strawfrank Junction. On the first of the two runs, moreover, we attached at Strawfrank in addition the Liverpool and Manchester section of the Edinburgh train, bringing the load up to the vast aggregate of 62 axles—eleven 8-wheelers and three 12-wheelers—thereby considerably more than doubling the previous weight of the train. But on the second run the increase was a more normal one of three 8-wheelers and a 12-wheeler for London.

But little need be said of the first run as far as Carstairs, on which the large 4–6–0 superheater engine No. 907—now, alas! no more—had a modest load of 5 "eights" and a "diner"—183 tons emply and 195 tons full. With this light train we covered the 12·8 miles to Motherwell, in the main steeply uphill, in 19 min. start-to-stop, and from there passed Law Junction, 5·4 miles, in 12¼ min.; Cleghorn, 13·2 miles, in 24 min. 5 sec.; and reached Strawfrank Junction, 16·3 miles, in 29 min. 5 sec. Eleven continuous miles from Motherwell are uphill, as far as Craigenhill Summit, chiefly at 1 in 98 to 1 in 140, but we were running under easy steam. At Strawfrank, as previously mentioned, the load was increased to the formidable total of 62 axles, 438 tons empty, and no less than 470 tons with a substantial load of passengers and luggage, while we enjoyed the luxury of pilot assistance to Beattock Summit in the shape of No. 899, a "Dunalastair" of the third batch.

The actual start from Strawfrank is level for a mile, but two short banks are encountered before Symington—one of 2¼ miles at 1 in 150, and the other of 1¼ at 1 in 100, with a short intervening descent—nevertheless, we were through Symington, 6·3 miles, in 9 min. 55 sec., and Lamington, 10 miles, in 13 min. 50 sec., speed rising on the short descent to the Clyde to 64 m.p.h. At Abington, after 4¾ miles up varying from 1 in 200–332, we were doing 52 m.p.h.; at Elvanfoot, after 4½ miles' further ascent of a similar nature, culminating at 1 in 142–152 for 1½ miles, 47½ m.p.h., although speed rose to 54½ on the level 1¼ miles to the Clyde bridge. So the 5·4 miles from Lamington to Abington took 5¾ min., the 5·2 miles from Abington to Elvanfoot, 6 min. 25 sec., and the last 2·9 miles to Summit (concluding with 2¼ miles up at 1 in 99) 3 min. 50 sec. to the dead stop. This gave the really excellent



Photo] [*T. A. Corbett.*

GREAT WESTERN RAILWAY.
4–4–0 locomotive No. 3447, *Jackdaw*, at Hereford.

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time of 29 min. 50 sec. for the 23·5 miles from Strawfrank to Summit.

No. 899 now came off, leaving No. 907 to tackle the 470 tons load unaided. Beattock bank was taken at a very cautious rate, mostly under 60 m.p.h., so that it took us 11 min. 50 sec. to get through Beattock station, 10 miles, while 4 miles later, at the Annan bridge (after a further descent principally at 1 in 202) we were only doing 65 m.p.h. But a good speed was maintained on the easy undulations beyond to Lockerbie, speed continuing at 64 m.p.h. between Nethercleugh and Dinwoodie, so that the 13·9 miles from Beattock to Lockerbie were covered in 13 min. 25 sec. The 5 miles at 1 in 528, and 1¾ at 1 in 200 culminating at Brackenhill Summit reduced our rate to booking from pass to stop being 82 min., we had, therefore, done very decently.

On the other run the engine was No. 48, a superheater 4–4–0, and the load from Motherwell, where I joined the train, seven 8-wheelers and a dining car, 245 tons empty, and 260 tons loaded. A strong south-west wind, with snow and sleet accompanying, combined to make the running conditions bad. So we took substantially longer than 907 to Strawfrank, passing Law Junction in 13¼ min.; Cleghorn in 27 min. 20 sec.; and stopping at Strawfrank Junction in 32 min. 35 sec. Net time was 31½ min., owing to a signal delay outside Carstairs. Our load was now increased to 52 axles, totalling 377 tons empty and 400 tons inclusive, and again we were piloted to Summit, this time

Photo] [*E. A. Gurney Smith.*

GREAT WESTERN RAILWAY.
Down express passing Swindon.

44½ m.p.h., after which we touched 67 m.p.h. on the 1 in 200 descent to Kirtlebridge. But on the longer descent at the same inclination to the Esk beyond Gretna we went very easily, reaching 66 m.p.h. and then shutting off steam until almost to Gretna Junction, when the regulator was opened again and we touched 70. So the 9·1 miles from Lockerbie to Kirtlebridge took 10 min.; the 8·1 miles thence to Gretna 7 min. 40 sec., and the 4·5 miles from Gretna to Rockcliffe, where we were momentarily stopped by signal, 5 min. 5 sec., making a total of 45·6 miles from Summit in 48 min. exactly, start-to-stop. Unchecked we should have run from Summit to Carlisle (49·7 miles) in just over 52 min., making a total of 84 min. from Strawfrank. The original by No. 925, of the same class as No. 899. Speed fell to 37½ m.p.h. on the 1 in 150 before Symington, but rose to 60 m.p.h. at the Clyde bridge beyond Lamington; at Abington it was 51½ (immediately afterwards momentarily increased to 52½); before Elvanfoot 46, and at the upper Clyde bridge 52½ m.p.h. So the times were 10 min. exactly from Strawfrank to Symington, and 14 min. 5 sec. to Lamington; 6 min. 5 sec. from Lamington to Abington; 6 min. 20 sec. thence to Elvanfoot, and 4 min. 20 sec. on to Summit. This totalled 30 min. 50 sec., or a minute over the time made by 907 and 899 with a much heavier load, but still gave evidence of good work.

From Summit No. 48, unaided, with 400 tons passed Beattock in 11½ min. (at

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one time touching 72½ m.p.h. on the bank, but then slackening to 53!); a speed of 69 m.p.h. was then attained at the Annan bridge, while the rate beyond Dinwoodie was again 64 m.p.h. So the Beattock–Lockerbie length occupied 13 min. 20 sec., or 5 sec. less than before. But at Brackenhill the rate fell to 42 m.p.h., and though we attained 67 m.p.h. at Kirtlebridge, so sluggish was the running beyond Kirkpatrick—mostly without steam—that we never exceeded the mile-a-minute rate until beyond Gretna, when we contrived to touch 66 m.p.h. The time from Lockerbie to Kirtlebridge was 10 min. 5 sec.; from Kirtlebridge to Gretna 7 min. 50 sec., and from Gretna to Rockcliffe 4 min. 20 sec., while we reached Carlisle in exactly 52 min. from Summit, and 84 min. 50 sec. from Strawfrank. It is interesting thus to compare the work of the 4–4–0 and the 4–6–0 engines, although the latter appeared to have rather the best of it, all circumstances considered.

In comparison with these, a couple of runs—one of my own, and one from a valued correspondent—are interesting as showing the first-class work of which the enlarged "Dunalastairs" are capable, with loads as great as these, and yet without pilot assistance to Summit. The train in both cases was the 2.0 p.m. South-bound express from Edinburgh, after attaching the Aberdeen portion at Symington, the full load on the first occasion being 400 tons, and on the second 380 tons. Curiously enough, the engine in each instance was No. 923, and the work in both cases was very similar. On the first journey a speed of 60 m.p.h. was reached at Lamington, while the minima at Elvanfoot and Summit were 42 and 32 m.p.h. respectively, with an intervening maximum of 50 m.p.h. at the Clyde; on the second run these figures were 61, 47, 49 and 31 m.p.h. in sequence. The intermediate times effected were: Symington to Lamington, 3·7 miles, 6 min. 6 sec. and 6 min. 5 sec.; Lamington to Abington, 6 min. 8 sec. and 5 min. 55 sec.; Abington to Elvanfoot, 6 min. 46 sec. and 6 min. 40 sec.; and Elvanfoot to Summit, 4 min. 16 sec. and 4 min. 25 sec.—total from Symington, 23 min. 16 sec. and 23 min. 5 sec. respectively for the 17·2 miles. Schedule time is 22 min.

Descending to Beattock No. 923 on the first occasion took 10 min. 19 sec. from Summit and on the second 10¼ min. At the Annan the maximum speed on the first occasion was 67 m.p.h., and at Nethercleugh 63, but fast running on this section was spoiled on the second run by a bad permanent way check north of Wamphray. So the Beattock–Lockerbie time on the first journey was 13 min. 25 sec., and on the second 15 min. 5 sec. The minimum rate at Craigenhill on the 400-ton trip was 50 m.p.h. and on the 380-ton 47½ m.p.h., while the maxima were 67 at Kirtlebridge and 75 at Gretna in the former case, and 66 and 74 in the latter respectively. Thus the respective times from Lockerbie to Kirtlebridge were 9 min. 17 sec., and 9 min. 50 sec.; from Kirtlebridge to Gretna, 7 min. 16 sec. and 7½ min.; from Gretna to Rockcliffe 3 min. 58 sec. and 4 min.; and from Rockcliffe into Carlisle 4 min. 34 sec. (in virtue of a very smart stop) and 5 min. 10 sec. The total times were 48 min., 49 min. and 51 min. 50 sec. from Summit (49·7 miles) and 72 min. 5 sec. and 74 min. 55 sec. from Symington (66·9 miles) respectively, the net times from Summit and Symington in the latter case being 49 and 73 min. Even though schedule time is 73 min. for this run, such work as this was most praiseworthy for locomotives of so comparatively moderate tractive capacity, but this is not the first time that excellent work on this particular train has been recorded in these columns. I should like to have added a further series of experiences on the Glasgow and South Western and the Highland Railways, but these must wait for a more opportune occasion.

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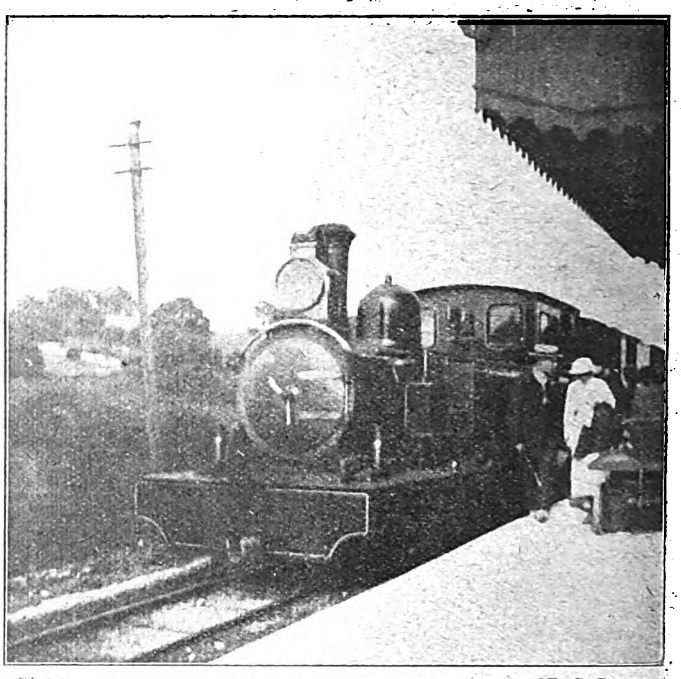
Leek and Manifold Narrow Gauge Railway.

By BASIL MERCER.



Photo] [*E. C. Deacon.*

LEEK AND MANIFOLD RAILWAY TRAIN AT WATERHOUSES.

FOR several reasons narrow gauge railways have not been laid down to any great extent in England or Scotland, though Ireland has a fairly large proportion of them. There are plenty of *light* railways constructed to the standard gauge of 4 ft. 8½ in., among which may be mentioned the Bideford, Westward Ho! and Appledore, Mid-Suffolk Light Railway, and the Weston, Clevedon and Portishead. There are also examples of light railways built as branches to the larger systems, as in the case of the Dornoch branch of the Highland Railway and the short Hemyock branch from Tiverton Junction on the Great Western main line. Some of these are constituted as separate companies, and leased to or worked by one or other of the standard railways. This latter type of construction has the obvious advantage of avoiding break of gauge. On the other hand, the commercial disadvantages are numerous and obvious: all the appurtenances must be of the same size as those on a standard line, and if the light line is to be used, as in the case of the Dornoch line, "for the largest and most modern types of rolling stock," the curves will need to be of correspondingly large radius. This last condition adds greatly to the initial cost, and may even render impossible the construction of a railway in certain difficult locations.

Those who know the Manifold Valley will grasp this point at once. Here we have a vale that is practically no more than a ravine; there is little space at the lowest level, there are corkscrew-like curves, nor are there any ledges on the hillsides along which a track could be carried. The Festiniog Railway in North Wales makes use of a number of ledges, but the Manifold Valley has been so formed by nature that it presents no such aids to the engineer or contractor. The celebrated Dovedale, which is not far away as the crow flies, is a similarly fashioned natural feature, but even narrower; and it is more than doubtful that traffic by rail, or even by road, will ever disturb the serenity of the scene. The poet Wordsworth, who was always opposed to the advent of railways in wild places, wrote an impassioned verse commencing:—

"Is there no nook of English ground
Secure from rash assault?"

when the Kendal–Windermere line was promoted. There will be no occasion for a future poet to denounce railway construction in Dovedale, and but for the adoption of the narrow gauge of 2 ft. 6 in., the almost equally beautiful Manifold Valley would have remained untouched by the hand of the railway contractor.

One of the main functions of a narrow gauge line should be to act as a feeder to the

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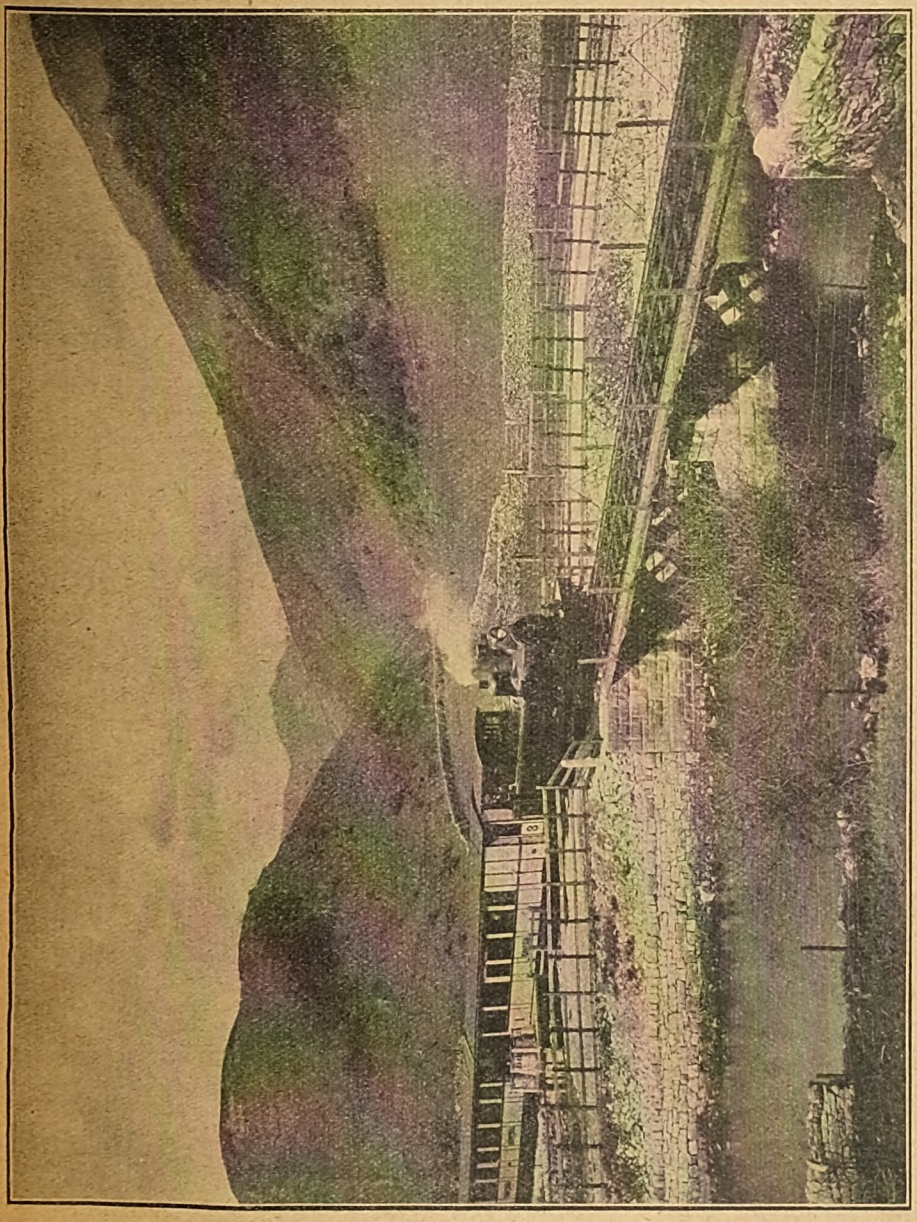
parent system. From the fact of the lessened cost of construction and maintenance, one of these little lines can be built and operated where a branch of standard gauge would not be a commercial or feasible undertaking. There are, of course, exceptions to every rule, and the Festiniog line, owing to its having access on its own metals to the sea at Portmadoc, is more or less independent of neighbours, though it exchanges traffic with the London and North Western at Blaenau Festiniog. In the case of the Manifold Railway, the North Staffordshire is the parent, the narrow gauge line being worked by its larger neighbour. Difficulties caused by break of gauge and consequent transhipment of goods has been overcome by the use of carrier wagons on the narrow gauge lines which convey the standard gauge vehicle bodily with its load. There is no



[*Harrison & Sons.*

LEEK AND MANIFOLD LIGHT RAILWAY TRAIN IN CHARACTERISTIC SURROUNDINGS.

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handling of goods and no delay, the process being no more troublesome than transferring a wagon from a main line train to a branch goods train.

The section of Staffordshire through which the Leek and Manifold line runs produces considerable quantities of milk and dairy produce generally. Agriculture is not, however, the sole stay of the line, for there is a considerable passenger traffic. There are two main inducements for travellers to visit these parts, the miniature railway and the scenery; sometimes the former is the attraction, sometimes the latter. There are many, however, who are attracted by both, so we will first consider the line as a *railway*, and come to its scenic delights afterwards.

The Leek and Manifold Railway was one of the earliest narrow gauge lines to be proposed after the passing of the Light Railways Act of 1896. Actual construction was started in March, 1902, though the Duke of Devonshire had performed the ceremony of cutting the first sod in 1899. The line was opened in May, 1904, and, as sometimes happens in railway undertakings, the cost greatly exceeded the estimate: when one understands the character of the country this is not surprising. In addition to the subscribed capital, a sum of £10,000 was lent by the Staffordshire County Council, and a further loan of £7,500 was provided by the Government, in addition to £17,500 as a free grant.

In common with the now defunct Manchester and Milford and several other early railways, the Manifold Company has no stations named after either of its titles. It runs through a section of the Manifold Valley, and terminates at the little village of Hulme End, but its connection with Leek is obtained over a standard gauge branch of the North Staffordshire Railway from Leek to Waterhouses, where the narrow gauge line starts. This branch leaves the Leek–Uttoxeter line near Cheddleton and throws off a mineral line to Caulden, where there are lime works and quarries. This normal gauge branch was, curiously enough, not finished for some time after the smaller railway was opened, so communication between Waterhouses and Leek had to be by road, the North Staffordshire providing the vehicles. We have spoken of this railway as a "parent," and there is some good foundation for so saying; before the "little line" was opened a 99 years' agreement was entered into, by which the North Staffordshire agreed to work the Leek and Manifold for 55 per cent. of the gross revenue.

So much for the inception of the Manifold line. The gauge, as we have remarked before, is 2 ft. 6 in., and the length of the "system" 8½ miles. Apart from the width of the gauge there is nothing toy-like about the Leek and Manifold, for everything is of the highest order and most solid description. Great credit is due to Mr. E. R. Calthrop, M.I.C.E., M.I.M.E., who designed the line and its equipment. The road is ballasted with limestone, and the rails, carried on transverse sleepers, to which they are secured without chairs, are 36 lbs. to the yard. With the exception of Hulme End, where the buildings are fairly extensive, the stations are not pretentious, but there is no need for elaborate arrangements at what are practically halts. The steepest gradient is 1 in 40, and there are several stretches nearly as stiff, for this part of Staffordshire is as mountainous as the neighbouring districts of the County of Derby. That nothing should be missing in the likeness to standard gauge railways, there is even a tunnel: this, which is near Ecton, is 170 yds. long, cut through solid rock.

The locomotives, of which there are two, were built at Leeds by Messrs. Kitson and designed by Mr. Calthrop; they are remarkably powerful and efficient tank engines of the 2–6–4 wheel arrangement. There is a leading radial truck and a trailing bogie, the remaining six wheels being coupled together. The rigid wheelbase is only 6 ft. The driving wheels are 2 ft. 6 in. in diameter, and the cylinders (placed outside) 11½ in. diameter by 16 in. stroke. A curious feature is that the balance weights are carried on brackets from the axles and not in the wheels themselves, as is the usual practice.

There are four passenger carriages, and the first thing that one notices about them is their size, for they are of liberal dimensions for the 2 ft. 6 in. gauge. Carried on two four-wheel bogies, they are 42 ft. long and 8 ft. wide. Height inside is 6 ft. 6 in. Two of these coaches are composites, having accommodation for 8 first and 22 third-class passengers, with a guard's compartment; the other coaches are third-class only and seat 44 passengers. Access is gained by end platforms, from which a beautiful view of the scenery may be gained when the weather is fine. The interiors are comfortably fitted up and the riding is excellent. Stone's system of electric lighting is fitted.

The remainder of the rolling stock comprises seven goods wagons of various types. There are all-steel covered wagons for the

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dairy produce traffic, and some low-side goods wagons. These last carry 14½ tons with a tare weight of 5½ tons. Last, but not least, are the transportation or "carrier" cars: these are low-side wagons with platforms extending outwards from the lower part of the body. In the platforms are slots shaped like tram rails, which provide a standard gauge track on the wagon platform. All that has to be done when transferring a standard gauge truck from its track to the transportation car is to run the latter up to the buffer stop, the narrow gauge road being laid so far below the level of the standard gauge track that the rails on the wider gauge exactly meet the channels on the carrier, the bogie centres of which lie immediately under the two axles of the ordinary goods truck. Two screw wedges placed beneath the wheels of the truck keep it in position on the transportation car. All the Leek and Manifold stock is of eight-wheeled bogie type, and every vehicle, passenger and goods, is fitted with the automatic vacuum brake.

It will be noticed that there are many features about this rolling stock unusual in British practice, but the Barsi Light Railway of India has for many years been using similar stock from Mr. Calthrop's design. The goods wagons and passenger coaches are practically the same as the Barsi Company's stock, but the Manifold engines are a modification of the pattern used in India, being slightly smaller and having six-coupled instead of eight-coupled wheels.

Two trains each way per day comprise the normal service, but there is an extra double journey on Saturdays and two extra on Wednesdays. There is also an up and down Sunday train. This is the ordinary winter service, but the villages adjacent to the line are very small, so that it is only in summer that the passenger traffic demands become at all considerable. There are eight intermediate stations ("stationettes" would, perhaps, be a more descriptive word), and the journey time is 40 min. in either direction.

While the Manifold Valley cannot compare for sheer beauty with its neighbour Dovedale, it has a grandeur and charm all its own. There is one striking similarity between these two dales, both of them begin and end with an almost disconcerting suddenness: one minute you are quite in open country, the next you are in a rugged and leafy paradise. The Manifold line may be approached either from Leek, on the North Staffordshire, or Hartington, on the London and North Western Ashbourne–Buxton line. The latter is, perhaps, the more attractive, as the change from the high bleak tableland towards Buxton to the quiet wooded valley is most pleasing. From Hartington station, which is nearly 1,200 ft. above sea level, one descends a mile and a half along a winding and picturesque road to Hartington village.

Two miles further on we come to Hulme End, where the Manifold Railway begins, or ends, as the case may be. Here, if our arrival has been timed rightly, we find our train waiting, and after running along a short piece of straight road—a rarity on this line—we enter the valley. At Ecton, the first station, a small tributary stream joins the river Manifold (sometimes spelt Manyfold), and hard by is the only tunnel. As its name implies, the Manifold has many windings or "folds," and so has the railway! Near Ecton is a now-disused copper mine, the principal shaft of which is 1,400 ft. deep. This mine, though it does not pay to work nowadays, was formerly a very rich property; so much so that one year's yield supplied the Duke of Devonshire with funds to build the famous Crescent at Buxton. Butterton is the next station, and at Wetton Mill the vale is beautiful indeed. Passing Redhurst, we come to Thor's Cave; the cave in question is 40 ft. wide and 60 ft. high, and is well worth a visit, as, in addition to its natural beauties, it possesses considerable antiquarian interest. Celtic and Roman remains in the shape of bone combs, arrowheads, rings, coins, and other similar relics have been discovered there. Near Thor's Cave station the river Manifold runs underground, and only appears on the surface in very wet seasons.

Leaving Thor's Cave and its hill, Wetton Law, we come to Grindon and Beeston Tor, the latter being the station for the eminence of the same name. Here the view from the train is particularly fine, and one realises that even a narrow gauge railway train can move too quickly for full enjoyment of the prospect. All the hills are richly wooded. Our next call is at Sparrowlee, a pretty little spot, "and so to Waterhouses," as Pepys would have it. But the scenic charms are by no means exhausted yet, for Waterhouses possesses its Fairy Caves, celebrated for their curious stalactite and limestone formations. Thus ends the Leek and Manifold Light Railway, for the remainder of our journey is made in an ordinary standard gauge branch train.

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Locomotive and Train Working in the latter part of the 19th Century.

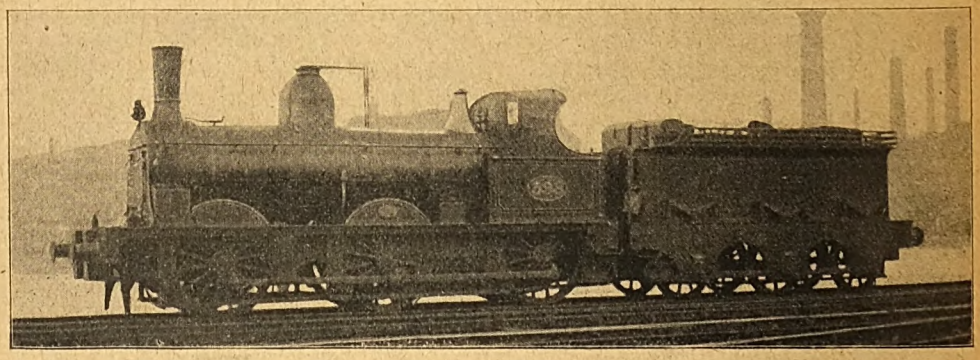
NORTH EASTERN RAILWAY. [No. VI.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 196, *March* RAILWAY MAGAZINE.)

ON the North Eastern Railway the brake question was solved at a comparatively early date by the adoption of the Westinghouse as standard. Until about 1882 Smith's *simple* vacuum, as used on the Great Northern and the Manchester, Sheffield and Lincolnshire Railways, was employed for the through East Coast express trains, but being non-automatic it disappeared from this date. The North Eastern was the first English railway to fit goods engines with a continuous brake for excursion trains, and in 1881 there were a considerable number equipped with the Westinghouse.

The later phases of the "Aerolite" described previously have however, brought this account down to a period considerably in advance of that with which I have so far dealt, for we have really only come to the year 1883, the time of Mr. Fletcher's resignation on account of advancing age. Mr. Fletcher had held the North Eastern locomotive reins for so many (I believe more than 30) years that he was looked up to as a sort of father by his department and the men. The latter he understood thoroughly, and as he allowed a great deal of latitude, he was naturally very popular, but whether his lenient "old school" methods were the best for the period is a point that need not be discussed. But they had the effect of rendering the position of his successor, Mr. Alexander McDonnell, extremely difficult. Mr. McDonnell came over from the Great Southern and Western of Ireland Railway at Inchicore, a line that was steeped in the system of standardisation and traditions of Crewe. Now it would have been difficult to find any locomotive departments that were then so completely antipodal in their methods in every respect as Crewe and Inchicore on the one hand and Gateshead on the other. Mr. McDonnell was probably aghast when he found himself in charge of some 1,480 engines of several hundred different classes, and still more minor variations. Gateshead was eminently a place where *festina lente* methods were desirable, at least for a time, and it is just possible that the reforming zeal of Crewe ideas was started a little too hastily.



NO. 398 FLETCHER'S STANDARD GOODS ENGINE, BUILT AT GATESHEAD, 1875–1883 PERIOD.
Coupled wheels, 5 ft. Cylinders, 17 in. by 24 in.

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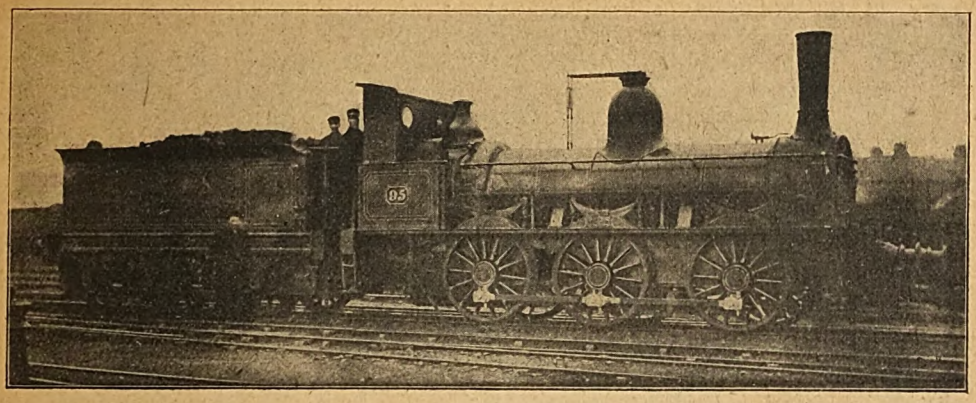
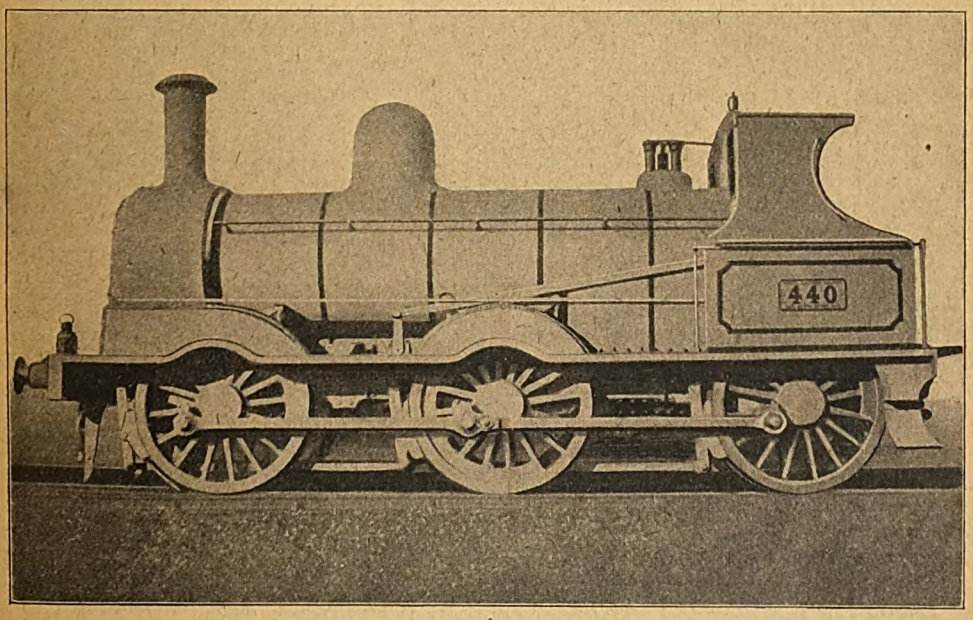


NO. 95 "SHORT COUPLED" MINERAL ENGINE.
Wheels about 4 ft. 8 in. Cylinders, 15 in. by 21 in.

The result was friction with the men. The Gateshead and Newcastle "Geordies" may be described as distinctly radical as far as politics are concerned, but in many other respects, such as ingrained habits and customs, there was not a more conservative body of men in the kingdom, and when Mr. McDonnell set about reforming a locomotive department of a sort that had gone on for so long in a smooth go-as-you-please style, he promptly came up against a dead wall of hostile opposition. Let it be said at once that beyond the error of judgment of not knowing the men with whom he had to deal, this was not Mr. McDonnell's fault, for he tried to do what ninety-nine other men out of a hundred would also have attempted. Neither do I wish to impute blame to the other side, for all the friction that arose was due solely to an entire difference of ideals and training, coupled with an unreasoning conservatism. Insofar as the locomotives were concerned there was a lot of blind prejudice. Mr. McDonnell's new engines had bogies. Bogies for express engines were then not popular with the North Eastern drivers,



NO. 440. THE FIRST MCDONNELL GOODS ENGINE BUILT AT DARLINGTON, 1883.
Wheels 5 ft. 1 in. Cylinders, 17 in. by 26 in.

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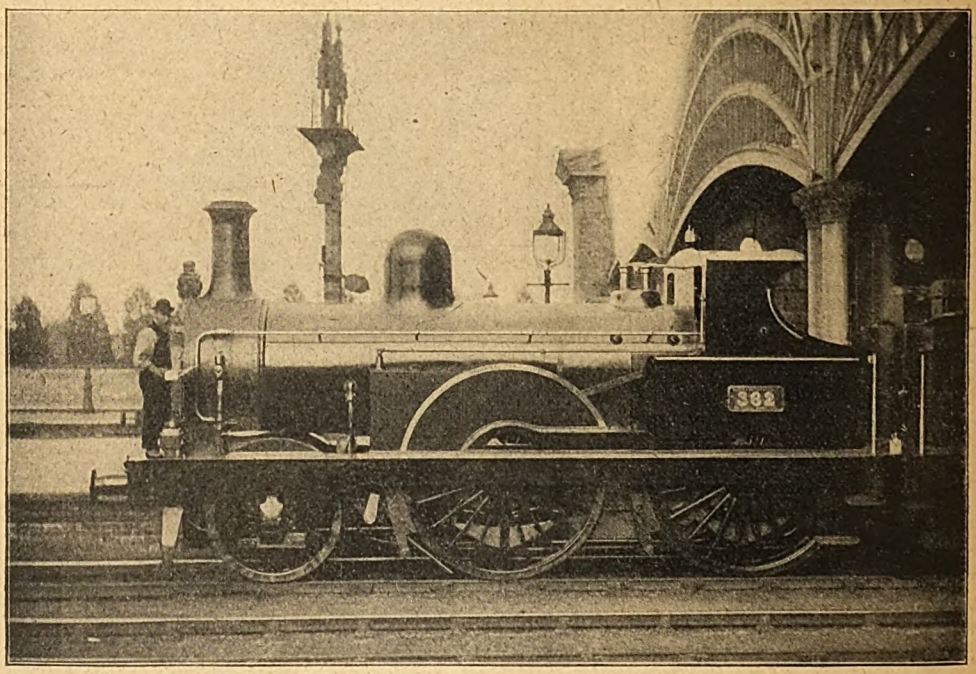
who considered them a totally unnecessary and uncalled for fad. Mr. Fletcher's chimneys had the narrowest diameter at the bottom and tapered outwards towards the top, whereas Mr. McDonnell's chimneys were parallel or tapered the other way. Consequently many of the men at once said that the engines could not steam, and I am afraid that they had so decided before giving them a fair trial. Then but by no means the least important item—the "exhaust cocks." I have already explained in an earlier portion of this article the function of these so essentially Fletcher adjuncts. They certainly had other railways got along very well without them, it was politely but firmly intimated that "the old mon" (meaning Mr. Fletcher) had forgotten more about locomotives than all the other locomotive engineers in the country had ever known. In this connection it is pleasant to record that a deep loyalty to Mr. Fletcher was a characteristic of the northern North Eastern Railway men of this period.

Finally the new colour for the engines was also somewhat of a sore point. Mr. McDonnell introduced the dark olive green picked out with red and white lines that used



Photo] [*Locomotive Publishing Co., Ltd.*

NO. 362. 2-4-0 EXPRESS ENGINE (FLETCHER), AS ALTERED BY MCDONNELL.
Wheels, 7 ft. Cylinders, 17½ in. by 24 in.

their good points in softening the blast, but Mr. McDonnell apparently did not like them, for he gave orders for them to be removed. This was more than the patience of an overwrought running staff could stand. I believe that several indignation meetings were held on the question of "exhaust cocks," at which the subject was discussed from every standpoint except that of Mr. McDonnell, and various resolutions were passed, all of which "emphatically denounced" the abolition of these fittings. For a locomotive without an exhaust cock was a thing not to be thought of, and if you mildly suggested that to be so well known on the Great Southern and Western Railway of Ireland. Anyway it was not a suitable colour, at least so many of the North Eastern men said. And so the story continued, until the unrest terminated with the resignation of Mr. McDonnell after about eighteen months of troubled superintendency. Some of the men frankly admitted to me years afterwards that they had not treated him fairly, and to bear this out I may instance the opinions held by them on the subject of the very handsome goods engines of his design—the 440 class. When these were new, there was hardly

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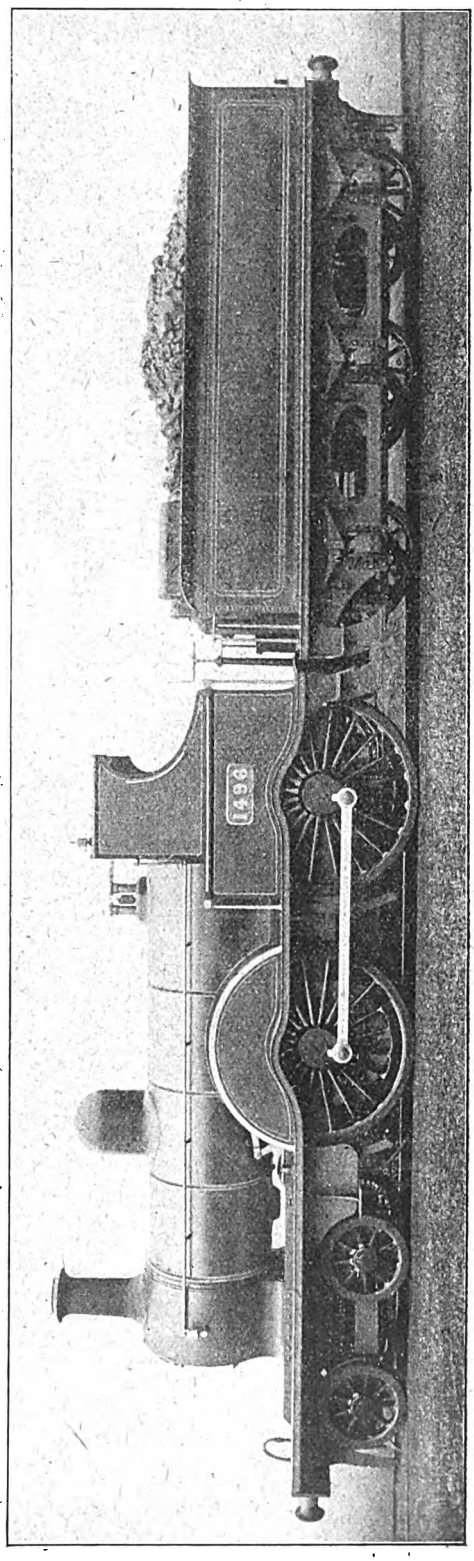
anything too bad to be said about them, they could not do the work, they could not steam, etc., etc. Some years afterwards they were considered by the drivers to be the best and most popular goods engines on the line, and the same men who gave them such a bad name for steaming, etc., were the very ones to do their best to get one of these engines allotted to them.

The engines in question had 5 ft. 1 in. coupled wheels and 17 in. by 26 in. cylinders, and 140 lbs. pressure. There are 44 of them, of which 32 were built at Darlington and 12 by Messrs. Stephenson and Co.—the latter with a different shape to the framing. They are now officially known as the 59 class, although 440, which was built in 1883, was the first to be constructed. Two of these, Nos. 498 and 606 had large wheels about 5 ft. 6 in. in diameter.

I may add here that the present and much neater appearance of the North Eastern engines dates from Mr. McDonnell's arrival. He introduced the first of the round topped plain domes and Ramsbottom valves, not only in his new engines, but in a certain number of rebuilds.

One of Mr. McDonnell's earliest alterations to passenger engines consisted in a change in some of the details of several of Mr. Fletcher's 7 ft. coupled express engines, the first to be so treated being 925. The round topped and much more shapely dome, the Ramsbottom valves and much neater cab, greatly improved the appearance of the engine, but the alteration of the reversing lever from the usual right hand to the left hand side, after the manner of the London and North Western Railway, met with considerable opposition from the men. In some half a dozen others similarly modified of which 362, illustrated on page 270, was one, an additional alteration was made by removing the plate springs of the leading wheels and substituting for them volute springs placed behind the framing and below the platform in an inaccessible position.* Although Mr. McDonnell probably had his reasons for this change, I must confess that I was never able to discover the advantage of it, and some time after his departure the original plate springs above the framing were restored.

Early in 1884 the first 4–4–0 express engine



NO. 1496. 4-4-0 EXPRESS ENGINE (McDONNELL) 1884-5. ONE OF THE TWELVE BUILT BY R. W. HAWTHORN AND CO.
Coupled wheels, 6 ft. 7 in. diameter. Cylinders, 17 in. by 24 in.

* It may be of interest to remark that Mr. Patrick Stirling's 2-4-0 engines on the Great Northern also had the leading springs behind the frame, and were all subsequently altered by Mr. Ivatt.

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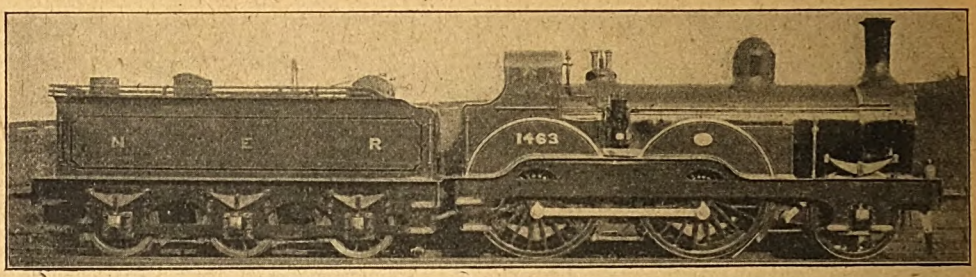
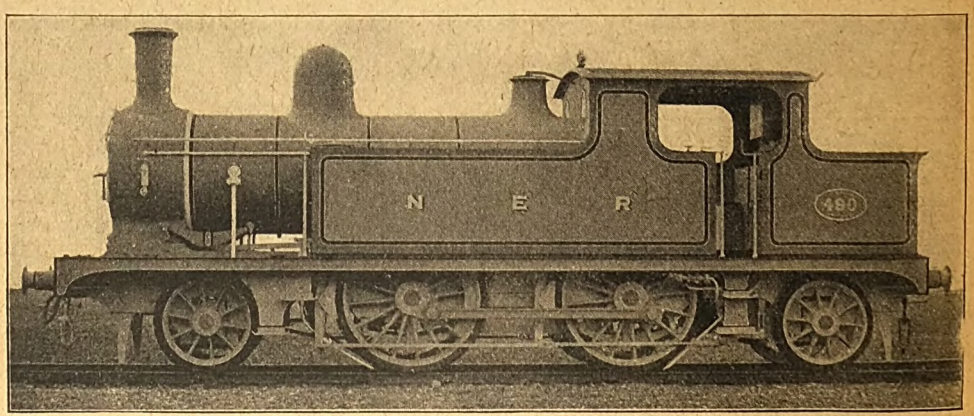


NO. 1463 "TENNANT" EXPRESS ENGINE (1885).
Coupled wheels, 7 ft. 1 in. Cylinders, 18 in. by 24 in.

of Mr. McDonnell's own design—No. 1318—appeared from Gateshead works. An order for twenty-four was put in hand at Gateshead but only 16 were constructed, although Messrs. R. and W. Hawthorn built an additional twelve engines of the class. These engines were a slight enlargement of Mr. McDonnell's previous Irish engines, and had 6 ft. 7 in. wheels, 17 in. by 24 in. cylinders, and 140 lbs. pressure. Of course they were much criticised when they appeared, and it must be justly admitted that, though they were good machines, they were neither large nor heavy enough to cope with the East Coast expresses, and their day on these was extremely short-lived. No. 1318 was employed for a time on the Scotch trains between Newcastle and Edinburgh. She was not remarkable as a time-keeper, and her fuel consumption was somewhat heavier than the "Fletchers," for she averaged 31·9 lbs. per mile at one period. The fact is that the design was a few years too late and the engines and boilers were too small. At this period most railways had adopted 18 in. cylinders, and the majority of them had also increased the stroke to 26 in. The result was that very few of this new class took their places on main line express work and they were shelved for secondary but nevertheless important services, such as the York and Scarborough, Leeds, etc., trains. A number of the Hawthorn's (1492 to 1503) worked the Newcastle and Carlisle line for many years, and when the old "Whitby bogies" were broken up, the "McDonnells" took their places on the services from Whitby to Malton, Stockton, etc. 1492 to 1499 were generally on the Carlisle road but 1500 to 1503 worked the line from Whitby to Stockton *viâ* Picton Junction. In justice to these engines it should be added that they were exceedingly "free" and fast runners.

The last eight of the 24 engines ordered to be built at Gateshead were never constructed as passenger engines, for after Mr. McDonnell had left, the order for them was altered and they came out with a new design of framing, wheels, etc., as 0–6–0 goods side tank engines.



NO. 490 (A CLASS) BUILT AT GATESHEAD, 1886.
Coupled wheels, 5 ft. 7 in. diameter. Cylinders, 18 in. by 24 in., fitted with Joy's valve gear.

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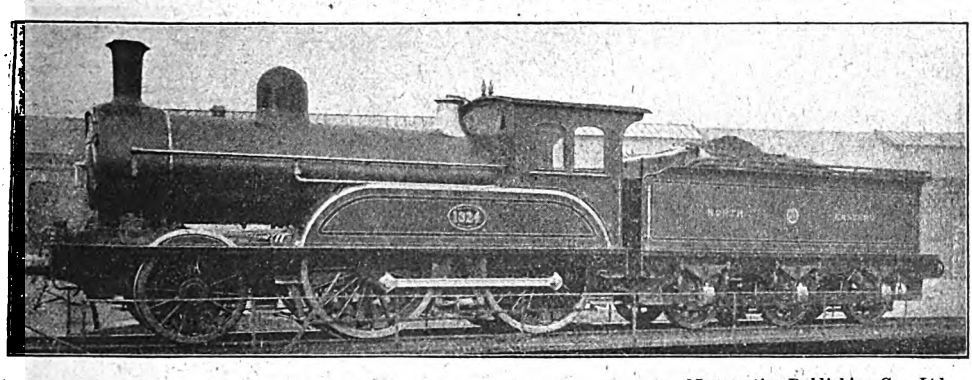


Photo] [*Locomotive Publishing Co., Ltd.*

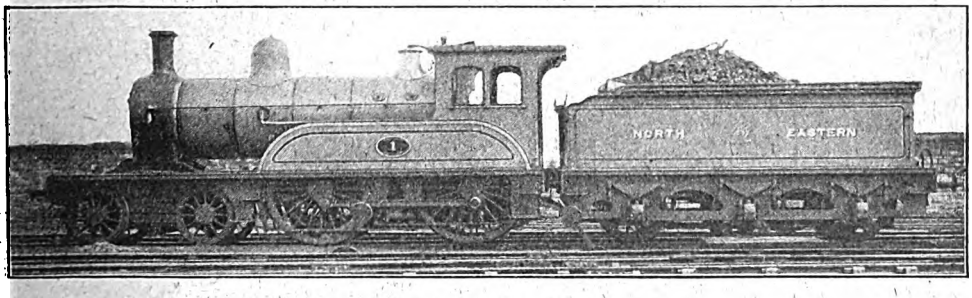
NO. 1324. MR. T. W. WORSDELL'S FIRST COMPOUND EXPRESS ENGINE (1886).
Coupled wheels, 6 ft. 8¼ in. Cylinders, H.P., 18 in. by 24 in.; L.P., 26 in. by 24 in.

After Mr. McDonnell's departure there was an interregnum, which at all events had the effect of allowing matters gradually to settle down again, whilst the northern "Geordies" had time to take stock of themselves. For several months in 1884–1885 the nominal chieftainship of the locomotive department was vested in the General Manager, Mr. Tennant, who was assisted by the works managers at Gateshead and Darlington and a locomotive committee. During this period twenty very fine 7 ft. coupled express engines were built, Nos. 1463 to 1472, at Darlington, and 1473 to 1479 and 1504 to 1506 at Gateshead. These engines, which have always been known as the "Tennants," may be described as improved "Fletchers." They were of the 2–4–0 pattern, and the cylinders were enlarged to 18 in. by 24 in. The pressure remained at 140 lbs.,* and the motion and many of the details were of Fletcher's design. The boilers, however, were modernised with neat domes and Ramsbottom valves, whilst the outside framing and cabs had a distinctly Patrick Stirling appearance. The Doncaster ideas were further embodied in transfer numbers instead of number plates, and these engines have not been modified in this respect. The "Tennants" were excellent engines, and immediately came into great favour with the men. The much disliked bogies were absent, the exhaust cocks reappeared, and the "Geordies" began to breathe freely once more. The "Tennants" were main line engines for many years,† and may still be seen doing very good work on secondary expresses. Their tenders were more modern and much neater than Mr. Fletcher's, and may be taken as the prototypes of those used by the two brothers Worsdell, though those of the McDonnell "bogies" were very similar.

Mr. T. W. Worsdell succeeded to the vacant locomotive superintendency in the summer of 1885, having come from the Great Eastern Railway. By this time the unrest had largely died away, and probably many of the more reasonable men had had time to see that improvements were inevitable, so

* Subsequently increased to 160 lbs.

† All of them were for some years stationed at Gateshead except 1463, 1465, 1466 and 1468, which belonged to York.



NO. 1. (CLASS F1).
Coupled wheels, 6 ft. 8 in. Cylinders, 18 in. by 24 in.
Originally 2-cylinder compound engines. This engine was re-numbered 356 in 1915.

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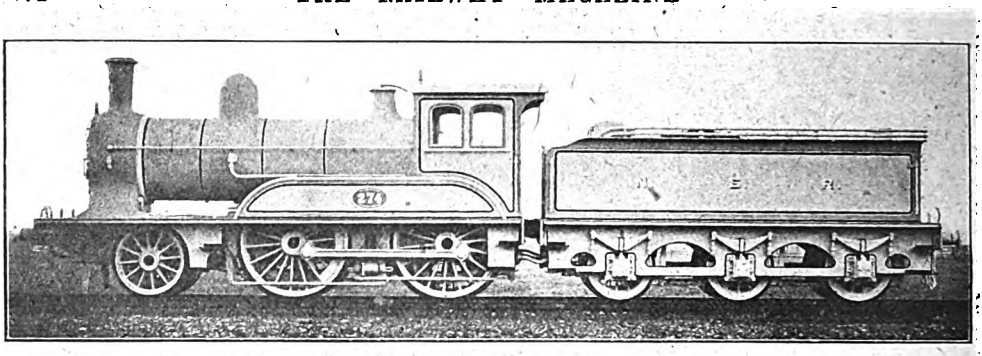

NO. 274. BUILT AT DARLINGTON, 1887–8.
Coupled wheels, 6 ft. 1 in. Cylinders, 17 in. by 24 in.
This class (G) were known as the "Waterburys" and converted from 1900 into 4–4–0 engines.

that these were afterwards accepted with much better grace.

Mr. Worsdell's first passenger engines were 2–4–2 side tanks, known as class A, and had 5 ft. 7 in. wheels and 18 in. by 24 in. cylinders. They have Webb's patent radial axle-boxes at each end, and 160 lbs. pressure. Mr. Worsdell immediately adopted Joy's valve gear for all classes of passenger and goods engines except the small shunting tank engines—class E. At this period 1886–90, many railways began to adopt Joy's valve gear. Mr. Worsdell had used it for a number of Great Eastern engines, and by 1889 not only the North Eastern but also the London and North Western Railway (which was the first to adopt it), the Lancashire and Yorkshire Railway and the Manchester, Sheffield and Lincolnshire Railway had made it standard. But it has only survived on the London and North Western and the Lancashire and Yorkshire Railways, for the others, including the North Eastern, discarded it in 1892–3.

But Mr. Worsdell also introduced two-cylinder compound passenger and goods engines. The first express engine, No. 1324, built in 1886, had 6 ft. 8 in. coupled wheels, H.P. cylinders 18 in. diameter, L.P. cylinders 26 in. diameter by 24 in. common stroke and an increased boiler pressure of 175 lbs. Whether Mr. Worsdell wished to humour the prejudices of the men and not introduce too many improvements at once I do not know, but this particular engine came out as a 2–4–0 without a bogie, the leading wheels having inside frames only and being of the large diameter of 4 ft. 7½ in. He earned their gratitude, however, by introducing the well known roomy American cab with side windows, which afforded excellent protection against the cold biting winds of the North East Coast. The next year, 1887, saw the reappearance of the inevitable bogies, and as they had to come, and the men began to see it, they were accepted with comparative calmness. It is a strange commentary on the undoubted opposition to bogies that the North Eastern was the earliest railway to possess 4–4–0 tender engines with bogies. For there had been sixteen Stockton and Darlington engines built between 1860 and 1874 and also the ten "Whitby" bogies of 1864–5 previously described. But the latter were special for a very sinuous road, and the majority of the former had been converted into 2–4–0 engines.

Mr. Worsdell's new engines of 1887, twenty in number, consisted of ten non-compound engines (class F1) and ten almost exactly similar compounds (class F). The latter were the same as No. 1324 which preceded them, except for the addition of the bogies, and the non-compounds were also identical except that they had twin cylinders 18 in. by 24 in. and 160 lbs. pressure. One more engine, a 2–4–0 without bogie, similar to 1324 (class D) was built at Gateshead in 1888 with the substitution of Smith's piston valves instead of slide valves, and was the first engine so fitted. The heating surface of these compound engines was 1,323 sq. ft., of which the tubes supplied 1,211 sq. ft. and the firebox 112 sq. ft. They were put to work from the Gateshead end on the East Coast expresses, on which they did duty for several years. The ten non-compound engines—85 class—were, however, nearly all sent to Leeds and to York to work secondary passenger services from those centres. Fifteen more compounds of the same class were built in 1890, which were distributed at the various principal locomotive stations on the line.*

* These were Nos. 1532 and 1546.

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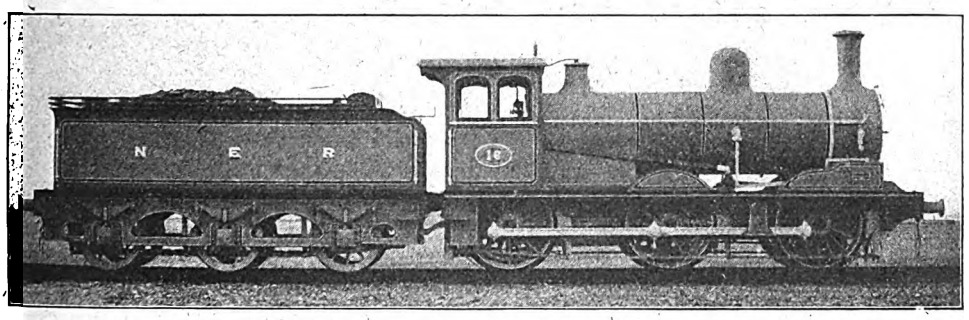
During the late 'nineties all the above engines were modified into non-compounds, and now form a homogeneous class of 37 engines known as class F1. The new 18 in. cylinders have piston valves and the Joy gear has been replaced by link motion. The former D class, which consisted of engines 1324 and 340 only, disappeared on amalgamation with the F1 engines.

Mr. Worsdell also constructed 20 smaller passenger engines at Darlington in 1887–8 known as class G, for local and branch line passenger trains. They always went by the nickname of the "Waterburys," and were 2-4-0 engines with inside frames for all wheels. They were non-compound with 17 in. by 24 in. cylinders and 6 ft. coupled wheels. The greater number of them were stationed at Hull, Selby and Leeds, where they took the places of Fletcher's 5 ft. 6 in. coupled engines of the old 675 class on stopping passenger trains, but a few were quartered at other sheds, mostly in the southern division. Like Mr. Worsdell's other engines, they originally had Joy's valve gear.

The "Waterburys" were not very popular with the men. Whether they suffered from a constitutional weakness of their "mainsprings," or had some other obscure internal complaint it is hard to say, but the fact remains that they were extremely sluggish engines. With light trains of six or seven coaches the old small 675 class were, as far as my personal experience went, the faster engines, though of course with loads greater than this, the more powerful "Waterburys" had the advantage. It is, however, only just to add that the latter were never built for express traffic, and consequently any marked efforts in the direction of speed were not expected of them. They had only some twelve to fourteen years of existence in their original form, for at about the beginning of the present century they were rebuilt with leading bogies and link motion instead of the Joy gear; at the same time the cylinders were enlarged to 18 in. In their original condition they never made much of a mark, and were always employed on stopping and slow trains.

Mr. T. W. Worsdell's standard goods engines, and 0–6–2 goods side tank engines were nearly all compounds with 5 ft. 1 in. wheels and 18 in. H.P., 26 in L.P. cylinders by 24 in. stroke. There were 30 non-compound tender engines, and 161 compounds, the former having 18 in. by 24 in. cylinders.



NO. 16. THE FIRST WORSDELL COMPOUND GOODS ENGINE.
Built at Gateshead Works, 1886.

Originally constructed between 1886 and 1892, the compounds have nearly all undergone conversion to simple engines. In the majority the Joy's gear and the valves on the top have been removed; and piston valves underneath the cylinders substituted.

The compound goods engines did good work so long as they ran through goods trains which had not too many stoppages, but they were not so satisfactory on the slow goods trains where considerable shunting had to be done. I do not know the reasons which induced Mr. W. Worsdell, who succeeded his brother, to abandon compounds and convert the majority to simple engines, but as far as the goods engines were concerned I think the drawback hinted at above had at least something to do with it.

(*To be continued.*)

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The Western Lines of the London and South Western Railway. [No. III.]

(*Continued from page* 101, *February*, 1917, RAILWAY MAGAZINE.)

THE NORTH DEVON LINE.

RETURNING to Yeoford Junction this, the original portion of the South Western routes from Exeter, must now be considered. Diverging at Coleford Junction, the line follows for many miles the course of the River Taw, traversing its lovely valley, and running through some of the most magnificent scenery in North Devon. The Taw is crossed many times, and the profuse vegetation, due to its continual presence, together with the hills and uplands on either side of the line, account for the exceptionally picturesque character of this route. Moreover, many of the intermediate stations are important centres for touring the country, for visiting the many places of interest, and for fishing and other sports, so that it is difficult to specify many of these stations as more important than others.

From Coleford Junction to Copplestone is double-track, but thereafter is single. At Lapford the two platforms are located on opposite sides of the road bridge over the line, and both face the same way, up trains passing at the back of the down platform. Eggesford station is beautifully situated in a tree-shaded amphitheatre, the line curving away ahead through the trees and towards the hills. South Molton Road occupies another beautiful tree-enclosed situation. This and other stations afford evidence in the wide spacing of the platforms of the fact that this section was once broad gauge, as mentioned in introduction.

At Portsmouth Arms magnificent views are had, with high hills all around. After crossing the Taw once more, the line curves round the base of wooded slopes, and in one place the railway is protected by a masonry wall, so close is it to the hillside. Similar scenic beauties attend the section through Umberleigh and Chapelton. From the former station to Barnstaple Junction is double-track. It may be mentioned that a number of the bridges over the Taw have been reconstructed for double-track, so that, in due course, other portions will, no doubt, be doubled to provide for the ever-growing traffic.

Approaching Barnstaple Junction a fine girder bridge over the widening Taw is crossed, and then the Great Western line from their station at Barnstaple comes in over a five span girder bridge. A good view is had of Barnstaple Town, and of its famous bridge, but for the present attention must be given to the busy station at the junction.

Here are two main platforms (with refreshment rooms and other offices) and two centre roads. On the up side is also a bay platform, and beyond are the goods sidings, engine shed, etc. Great Western through coaches are brought in from their station at the other side of the town, and at the junction formed into trains with the South Western vehicles for Ilfracombe; though in the season they are sometimes worked independently, either because of the loads, or according to time-table, in which case Great Western engines may work through.

On the lighter services the through South Western trains from Exeter are often composed of Torrington vehicles only, and passengers change for Ilfracombe, but on the special services, though there are usually Torrington vehicles, the Ilfracombe sections are generally considerably the heavier.

The main line engines always, however, take the Torrington portion, as the Ilfracombe line is worked by tank engines—now of Mr. Drummond's well-known 0–4–4 class—working only between Barnstaple Junction and Ilfracombe.

Immediately beyond Barnstaple Junction station the Ilfracombe line curves off sharply to a single line girder viaduct immediately alongside the old road bridge over the Taw, which is here of considerable width. The town of Barnstaple proper is on the further side of the river, and from the bridge another

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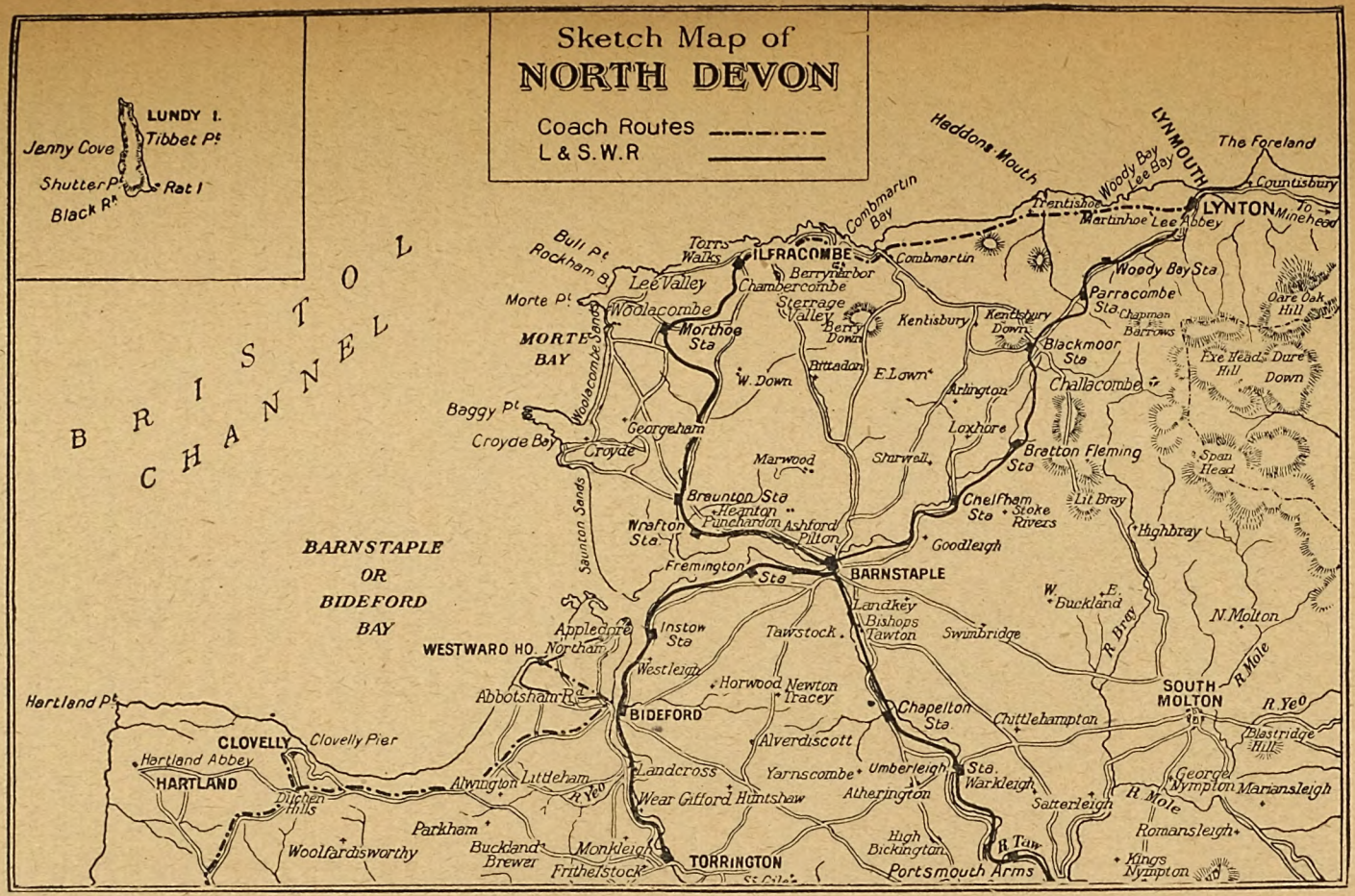

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sharp curve leads into the Town station, which is jointly owned with the Lynton and Barnstaple Railway. Incidentally, Great Western trains have to cross the river twice to proceed from their station to the Town station. The latter station is convenient to the main thoroughfares of this busy market town, the principal centre for a wide area. Towards the Great Western station is the residential portion of the town. There is a fine embankment alongside the river. As one of the oldest boroughs in the Kingdom, Barnstaple is rich in historical associations, while many old-standing manufactures are still carried on there. On market day—Friday—the town and the famous market hall are full of animation; but the great event of the year is Barnstaple Fair, when all North Devon seems to centre itself upon the town.

The Town station is peculiar in that, owing to its location, it has only one through line and platform, with the narrow gauge Lynton and Barnstaple tracks serving a bay on the other side of a portion of it. These diminutive trains—the gauge is only 1 ft. 11½ in.—necessarily attract special attention, and they deal with a considerable volume of traffic. This line is dealt with in a separate article, so that it will be sufficient now to mention that just beyond the station are transhipping banks for transferring goods from one system to the other.

As the Lynton line curves away to the north-west the main line continues as single-track over a swing bridge to Pottington level crossing, and then becomes double all the way to Ilfracombe. The single-track section is, however, only for 66 chains, so that the hindrance to traffic is not great. For several miles the railway then skirts the estuary of the Taw, here of considerable width, and one can see trains on the Torrington line following the opposite bank.

Through Wrafton to Braunton pretty country is traversed after leaving the waterside, and the curious hillside village at the latter station may be noted; but it is on the succeeding sections, as the railway gets among the high ground, that scenic interest becomes most manifest. Near milestone 220 the curves and grades of the route begin to get serious, the former adding much to the scenic interest of the route, while the latter, becoming more and more severe, until an incline of 1 in 40 for over 4 miles on end puts a very big strain upon the engines. Mortehoe and Lee station is virtually the summit, and the line then descends, round sharp curves in all directions, and through the valley towards the terminus. Here the views are truly magnificent, with hills all round, openings between them giving glimpses of the rocky headlands of the coast and of Lee Bay. Further on the line overlooks a series of reservoirs, arranged stepwise along the valley, which provide the water supply for Ilfracombe. And then, after traversing a short tunnel, separate for each line, while still high up the hillside, a marvellous view opens up along the valley to the town of Ilfracombe below, with Capstone Head and other heights beyond.

Seeing that from Mortehoe the line has not only been very sinuous, but has also been descending for the last two miles at 1 in 36, it is difficult to suggest a better situation for the station, perched as it is on a plateau far above the town. This involves a toilsome ascent when returning to the station, but short of a rack or other special type of railway, it is manifestly impossible to carry the line further into the town. However, the attractions of Ilfracombe itself—Capstone Head, the famous promenade round it, Hillsborough, Lantern Hill, the rocky bathing places reached *viâ* "The Tunnels," and the walks among "The Tors," etc., etc.—fully explain the peculiar popularity of the place. In a normal summer there are also many steamboat visitors, including large numbers who come across from South Wales, and Ilfracombe stands almost alone among North Devon resorts in that it caters for those who like plenty of amusement, as well as for those of a quieter bent who revel most in the glories of nature. Special features are the Victoria Promenade, the winter gardens and the Promenade Pier. Immediately opposite the Harbour is Hillsborough Hill.

A long article could be written extolling the attractions of Ilfracombe and district, but that must be "taken as read" on this occasion. Suffice it, then, to say that a first visit amply justifies the encomiums which have been passed by others, and even a hurried tour enables one to understand the peculiar favour Ilfracombe has realised with so large a section of the community, whether reached by South Western or Great Western services, or by steamer from across the Bristol Channel.

Adjacent to the station are the goods yard—principally concerned with the traffic of the town—and sidings, with a small engine shed. Mr. Hinde has been stationmaster for the last seven years. He is responsible for the traffic of both companies concerned, and

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this is no light undertaking when the season is at its height. The large numbers of passengers travelling by the principal services renders traffic working no easy problem in view of the 1 in 36 grade which faces up trains, commencing after a little piece of 1 in 55 immediately outside the station. But the Drummond tanks, which have succeeded the lighter Adams engines and the special 0-6-0 tender engines of the days

MR. A. H. HOYLE,
Western District Superintendent, London and South Western Railway.

when the line was only "lightly" constructed, do very well with 5 or 6 modern bogie coaches, beyond which even they require assistance.

Attention must now be given to the Torrington line. This is single-track throughout, except at stations, and for some distance from Barnstaple Junction follows the south bank of the Taw estuary, opposite the Ilfracombe line on the other side. At Fremington are the docks at the Pill which provided the first extension beyond Barnstaple Junction, this being included in the original scheme of the then Taw Vale Railway. The quayside here is fitted with cranes for shipping china clay received from Torrington as will be explained, and for general goods and coal traffic. Here, as the line has cut across Penhill Point, and is now curving slightly south-west, one has a splendid water scene spread out, and a view is had between Appledore and "The Neck" of the open sea with the guarding lighthouses.

Then opposite Instow, itself a favourite resort on a small scale (the station is right on the waterside), a magnificent view is had of quaint old Appledore on the opposite bank of the Torridge estuary. A picturesque run of about 3 miles brings us to Bideford "East-the-Water," and we are right in the heart of the land of "Westward Ho!" and amid the modern versions of the scenes which characterise Kingsley's immortal work. Approaching Bideford station the view is somewhat marred from the scenic aspect, seeing that in the "East-the-Water"

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portion of the town are concentrated the railway activities, with a busy goods yard and other associations; but leaving the station, of which Mr. J. Street has for some years had charge, the visitor passes the Royal Hotel, where is the famous Kingsley Room, and on crossing Bideford Bridge is landed in the heart of this old-time shipping port. Its glories in that capacity have departed as one of the penalties of modern progress, but the town is still an important market centre, there are several local industries in full operation, and Bideford has attracted a new population of a superior residential character, while it is the "Mecca" of the thousands of tourists whom the magic of Kingsley's pen has attracted, not only from all parts of the United Kingdom, but also from America and from far-away British colonies.

The famous bridge has 24 arches, and its length is 677 ft. It was built during the 14th century, and is the subject of several legends, but was altered early last century so that in crossing it a modern aspect is presented, though when viewed from the quay it appears substantially as of old. The famous Quay is now a modern promenade, and alongside it may be seen coasting vessels probably not greatly different from those of the days of Amyas Leigh and Sir Richard Grenvill. At the end of the Quay are the Kingsley statue and the Kingsley Memorial Park.

On the Quay itself terminate the tracks of the Bideford, Westward Ho! and Appledore Railway, whose tram-like trains cross the peninsula to Westward Ho!—for the famous pebble ridge, and the now equally famous North Devon golf links—and through old Northam to a station among the steep streets of Appledore. This line also is dealt with separately.

Locally Bideford is an important trading centre, and there are several industries carried on in the district. A feature of the traffic is the large numbers of rabbits despatched in the season, sometimes amounting to 100 hampers a day. Bideford still maintains some of its shipping activities, and there is a little shipbuilding carried on, there and at Appledore; but in these days it is primarily a tourist centre, together with a large section of the "Brotherhood of the Golf Club," in view of the fact that the Royal North Devon Golf Links rank among the finest in the United Kingdom, and many of the most important events in reference to the "Royal and Ancient Game" are carried out there. From Bideford motor tours are run to Clovelly and Hartland, including those operated by the London and South Western Railway to Clovelly and Bude.

From Bideford the railway continues to follow the course of the Torridge, which becomes distinguished for scenic beauty, and then strikes inland to Torrington, the terminus of the line. Compared with Bideford there are not many passengers for Torrington, but in the aggregate there are large numbers of visitors and the village—"A City which is set on an hill"—is well worthy of attention. There is a fine bowling green—the town is one of the principal centres for the game—on Castle Hill, and from the heights one has magnificent views over the valley of the Torridge, which is here very tortuous and picturesque. Owing to its situation—on a hill and surrounded by seven other hills—Torrington has been described as the "English Jerusalem," though it probably has no Jewish population whatever.

The station is low down in the valley, with limited sidings and a three-engine shed, and as the end of the branch, Mr. Willcocks, stationmaster, is responsible for the terminal work, which in a normal summer includes a restaurant car train, kept there over night. Usually two engines are stationed at Torrington, and on the occasion of our visit these included No. 526, an Adams 6 ft. 6 in. 4–4–0, driven by one of the oldest drivers on the line, whose work dates back to the period when the North Devon line was operated on the broad gauge. This engine is usually employed on shunting duties for part of the day and then works one trip to Exeter and back. The other locomotive is a Drummond tank which after taking the first train from Torrington to Barnstaple Junction works on the Ilfracombe line. In the season a second 4–4–0 engine is required, but otherwise Exeter or Barnstaple engines work the trains.

In the goods yard at Torrington are some 3 ft. gauge tracks, for transhipping with the North Devon Clay Co., whose narrow gauge lines extend from Torrington station some 6 or 7 miles to Marsland, where are large deposits of china clay, much of which is brought down to Torrington and thence to Bideford or Fremington for shipment. This line is worked by 0–6–0 tank engines, which in addition to china clay also convey coal, agricultural produce, bricks, etc. A short

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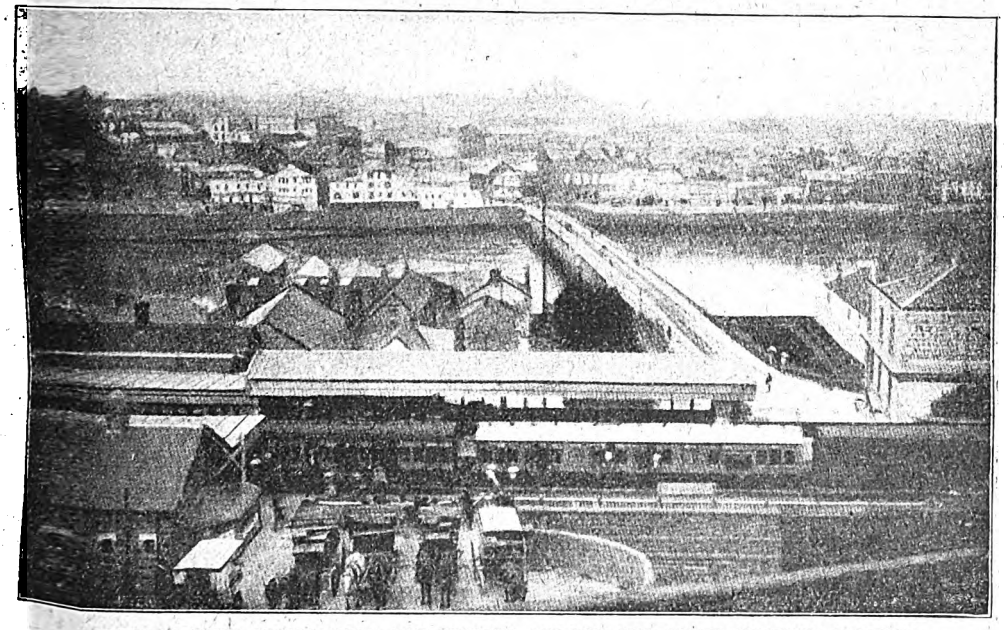
distance from the station the Marsland line crosses the Torridge by means of a somewhat remarkable "trestle" viaduct.

Locomotive Working and Gradients.

It has already been mentioned that for traffic working purposes the lines west and east of Queen Street station, Exeter, rank as separate divisions, and as the bigger 4–4–0 and 4–6–0 classes cannot be worked, even if their employment were justified, west of Exeter, virtually all passenger traffic, and much on the goods side, is done by the smaller and older main line classes. To Plymouth the Drummond "mixed-traffic" 4–4–0 engines take most of the principal



GENERAL VIEW OF BIDEFORD AND STATION, LONDON AND SOUTH WESTERN RAILWAY.

trains, though the 6 ft. 395 class are also employed, together with a few of the 6 ft. 6 in. 421 engines of the 116, 285, 300, 700 and classes. But the 5 ft. 6 in. mixed-traffic engines are the favourite classes for these trains, amplified by some of the Adams 6 ft. 6 in. and 7 ft. 4–4–0 classes. These are, however, primarily the branch engines on the North Devon and North Cornwall lines, though to Torrington one or two Exeter trains are run by the 5 ft. 6 in. Drummond class. For goods duties on the Plymouth route the Adams 0–4–2 engines are used to some extent and for general goods working there are, of course, 0–6–0 tender engines in service, though on the branches the 4–4–0's do much of the work.

Between Barnstaple Junction and Ilfracombe the 0–4–4 tanks are employed as mentioned, and between Halwill Junction and Bude a 4–4–2 Adams tank is usually engaged. One or two of these engines are also stationed at Friary for general purposes in the Plymouth district. Banking engines at Exeter are all 0–6–0 tank engines. Reference has been made to the old Beattie 2–4–0 tank engines at Wadebridge. In the Plymouth district motor trains worked by 2–2–0 motor engines are used, but at Wadebridge a combined motor car operates the Bodmin line.

Speaking generally, all lines west of Exeter are steeply graded, besides involving many curves. High speed averages are therefore not practicable, while the general necessity for serving so many intermediate stations prevents more than a limited number of express runs being operated, even where single-line working does not impose hindrances. But all things considered the working is smart, and with the long runs between stations the all-station trains are very creditably operated, the severe grades and curves being the principal hindrances.

It is never an easy business to get through the Exeter stations, owing to the divisions and combinations of trains at Queen Street and the considerable interchanges of passengers and luggage at both Queen Street and St. David's. But west of St. David's the trains

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are smartly operated. To Crediton is fairly easy, with nothing more serious than 1 in 126. Between Coleford Junction and Bow are grades of 1 in 97 and 1 in 80, with sections at 1 in 76 and 1 in 80 or thereabouts onwards to Okehampton. To Meldon Junction is continuously at 1 in 77 for 2½ miles; and similar grades are quite common, up and down, over the North Cornwall line. From Okehampton to Plymouth is mainly descending, but this means that up trains have long adverse grades of 1 in 73, 75, 78, 80, 82, 89, besides other inclines not greatly easier, including one little piece at 1 in 58 near Lydford.

Beyond Launceston is a long climb, largely at 1 in 73 or nearly so to Otterham, while to Delabole up trains have an almost continuous climb at about the same grade all the way from Wadebridge. The Bude branch also has some similar grades.

Coach Services.

In conclusion reference may be made of the coach services operated by the London and South Western Railway in Devon and Cornwall. During the past summer these have been very much reduced. In fact, several of them have only been maintained to provide for certain long distance tours, any attempt to cater for more local interests being impossible except in so far as the scheme adopted would permit. But this is merely a temporary condition, and when normal conditions again obtain the tourist will be as well served as in the past, with railway operated motor and other tours through some of the most interesting districts not directly accessible by rail.

The principal features of the scheme operated last summer were as follows:

(1) By motor from Bideford at 4.10 p.m. (on arrival of the 11.0 a.m. from Waterloo) to Clovelly, whose charms and interests not only justify staying the night there, but which fully occupy the next day until 4.0 p.m., even if a longer halt is not practicable, to explore the district. Through tickets allow of a week being spent at Clovelly before proceeding. The situation of the little port of Clovelly is wonderfully picturesque. Rising from the shingle beach of a thickly-wooded ravine in Bideford Bay, it climbs the steep side of the cliff, forming "Clovelly Street," which has been the subject of more sketches and photographs than any other thoroughfare in the King's dominions. Clovelly offers further attractions in the famous Hobby Drive (closed on Sundays), winding round the hill that overlooks the sea for a distance of three miles; Gallantry Bower, with its magnificent woodland and marine panorama; Clovelly Court, the beautiful grounds of which are thrown open to visitors every day except Friday and Saturday on payment of 6d.; and Clovelly Dikes, the site of a military camp in the days of the early Britons.

(2) Leave Clovelly at 4.0 p.m. by coach for Bude, due 7.0 p.m.

(3) Leave the Falcon Hotel, Bude, at 9.0 a.m. by coach for Boscastle, due 12.0 noon.

(4) A brake or other conveyance leaves Boscastle at 1.15 p.m. due at Tintagel at 2.0 p.m., returning from Tintagel at 3.15 p.m. thus due at Boscastle at 3.55 p.m.

(5) Passengers after proceeding to Tintagel can either leave there at 4.15 p.m. for Camelford, or proceed at the same time from Boscastle to Camelford station, due 5.15 p.m., to join either the 5.29 p.m. train from Wadebridge, or to proceed thence to Tintagel—if the intervening time at Boscastle has been utilised there.

(6) On arrival at Wadebridge a coach runs *viâ* St. Columb to Newquay, calling at the Victoria, Atlantic and Headland Hotels, the last mentioned being reached at 8.35 p.m.

This, or the reverse arrangement has to be spread over three days, though in practice passengers usually spread it over a longer period as each place served offers many attractions, and the tour carries the traveller through much of the most beautiful scenery in North Devon and North Cornwall. Each section of the route is also available locally, and in normal times there are complete facilities for each day. Fares are very reasonable in view of the long distances covered, and the accommodation is good. Through fares are also in operation to Clovelly and to Bude *viâ* Bideford from London, Exeter, Ilfracombe, Lynton and Lynmouth, and from Barnstaple.

Another important service is that from Exeter to Chagford, by motor omnibus, this route cutting across Dartmoor and reaching many places to which the railway does not provide access.

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British Railway Service and the War. [XII.]

RAILWAYMEN serving in the armed forces of the Crown, and fortunate enough to receive British newspapers of recent dates, must have read with extreme satisfaction the remarks made concerning themselves at the annual railway meetings that have been held. At most, if not all of them, the various chairmen have stated how many members of the staff have joined the Colours and, in some cases, further particulars have been added as to the number who have given their lives for their country, of those who are prisoners of war, and of the wounded. The proportion of the last class is unfortunately large, *e.g.*, on the Midland Railway, 1,970 out of a total of 15,168. Many, of course, have recovered from their wounds and have gone out again, but there must necessarily be a large number of the cases where men have lost a leg or an arm. For these the railway companies will have every sympathy and no one could read but with gratitude what Mr. Murray Smith, the chairman of the Midland Railway, had to say on this matter at the annual meeting of the company. He remarked: "It is generally known, the men who have left us, with permission to join the Forces will, on their return, if they wish to and are capable of resuming railway work, be found positions on the railway and at the same rate of wages as they would have been receiving had they remained at home; while the partially disabled men—and after two years of war their are many of these—who are unable to take up their old duties, will be and are, if possible, found work on the railway which it is within their power to perform. If a disabled man does not fit a machine, we try, by altering the machine, to make it fit the man, and we shall always endeavour to find a disabled man who wishes to work some work to do. As to the wages such men are paid, they receive the recognised rate of pay for the grade in which they are put. No account whatever is taken of any pension a man is receiving, whatever its amount may be. That we look upon as an honour the man has gained whilst serving his country."

MR. JOHN H. FOLLOWS,
Acting General Superintendent,
Midland Railway.

A very popular war-time appointment on the Midland Railway is that of Mr. John H. Follows to be acting general superintendent in the absence of the general superintendent, Mr. G. Paget. A native of Sandiacre, Derbyshire, on the Erewash Valley line, Mr. Follows entered the Midland Railway service in June, 1890, at twenty years of age, and after passing through various grades of the service was, in 1895, made stationmaster at Sawley, on the Trent and Derby line. In 1897 he was appointed assistant district inspector at Normanton, Yorkshire, and in April, 1901, was brought to the headquarters at Derby as traffic inspector; while in December of the same year he was given the post of traffic inspector in charge of the Derby district. In 1907 he was transferred to the general superintendent's personal staff, and was made superintendent of freight trains in 1911. In 1912 he was appointed divisional superintendent, his duties embracing practically the whole of the line, and he was made superintendent of operation in 1914, since which time he has really performed the duties of the position in which he is now officially appointed. It may truly be said of Mr. Follows that in his

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varied capacities he has gained a thorough knowledge of the line and its requirements. It may be added that the new acting general superintendent is a son of Mr. A. Follows, who was himself forty years in the Midland Railway service.

As becomes the premier British line the staff of the London and North Western Railway has provided a magnificent record for war service. The officers, clerks and men who have taken service with the Colours number no fewer than 22,216. Up to December 31st last 171 of these had received honours, or been mentioned in despatches for meritorious service; but the list of casualties is unfortunately a sad one, *viz.*, 812 killed in action, drowned, etc.; 389 died from wounds, etc.; 151 missing and presumed dead; 105 missing; 4,400 wounded, sick, etc., of whom 3,138 have returned to their military or naval duties, while 204 are prisoners of war. The company is keeping in touch with the wounded men, and to those of the London and North Western Railway staff who are prisoners of war and their whereabouts are known, parcels containing necessaries are sent.

Further staff re-arrangements on the London and North Western Railway consequent upon leading officers being given Government appointments by the War Cabinet have been made by the Directors, and Mr. I. T. Williams, the chief goods manager, is acting general manager during the absence of Mr. Guy Calthrop, who is now in control of the coal mines on behalf of the Government. Mr. Williams is chairman this year of the Goods Managers' Conference and the Goods Managers' Executive Committee, and he has also been elected to serve on the Executive Committee for the Government control of canals.

Mr. S. H. Hunt has been released by the Board of the London and North Western Railway to act jointly with Sir Richard Redmayne as assistant to Mr. Calthrop, the Controller of Coal Mines. Mr. S. H. Hunt was Commercial Assistant to the General Manager.

Addressing the shareholders of the Great Western Railway at the recent annual meeting, the chairman, Lord Churchill, remarked: "I have no doubt that you will be interested to hear that the number of our staff now serving with the Colours has gone up, roughly, to about 20,000. Many of them, I regret to say, have made the great sacrifice, for we hear that no less than 850 Great Western men's lives have been lost. A number of distinctions have been gained by Great Western men—eight Military Crosses have been awarded them, fourteen Military Medals, sixteen Distinguished Conduct Medals, and a number of them have been mentioned in the despatches from time to time. That is a record of which all of us connected with the Great Western Railway can be justly proud. We have filled the places of the men who are away to some extent, as you know, by female labour. I believe the total number of women and girls now in our employ is nearly 5,000. They are doing good work, and we are indebted to our staff throughout the system for the extremely zealous way in which they are doing their best to carry on the traffic in the most difficult circumstances. Our general manager (Mr. Potter), whom I am very glad to see here, and our chief officers have been working under the very greatest strain, and I think it speaks well for their efforts and their management that with depleted resources, reduced staff, and, at the same time, an enormous increase in the volume of traffic passing over the railway, that the business of the railway has been carried on with so little disturbance and dislocation as has been the case. I am sure you will join with me in heartily congratulating all our staff from the general manager and chief officers downwards."

War has had big effects on the staff of the London, Brighton and South Coast Railway. Recent records show that this railway's contribution of men to the forces, both naval and military, has continued during the year, and the number on active service has now reached 3,861, or over 23 per cent. of the total staff when the war broke out. Of these, 220 have fallen in action. The names of the men are recorded on a Roll of Honour. The Company has had news of 337 wounded and of 26 prisoners; 28 are missing. Best is done to keep in touch with the wounded and the prisoners, and to maintain a system of sending parcels of comforts to the prisoners with the aid of a fund created mainly out of the proceeds of the exhibition of the ambulance trains built in the Brighton works. The directors likewise endeavour to keep in touch with the dependents of the men who have gone to the front, and there are now 722 cases in which they are supplementing the Government separation allowances under the scheme adopted by the controlled companies.

During the past year the number of

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LONDON & SOUTH WESTERN RAILWAY

DEEDS OF VALOUR.

AWARDS

TO MEMBERS OF THE LONDON & SOUTH WESTERN RAILWAY COMPANY'S STAFF SERVING WITH HIS MAJESTY'S FORCES DURING THE EUROPEAN WAR.

BAGG, J. J. E. ✣ ✣ ✣

Cleaner, Locomotive Dept., Nine Elms. Private, East Surrey Regt., awarded Military Medal and Bar for delivering messages under shell fire and devotion to duty at Thiepval, September, 1916, and Ysee Trench, November, 1916.

FURNIVALL, L. S. ✣ ✣

Tracer, Engineer's Dept., Waterloo. Bombardier, Royal Field Artillery, awarded Military Medal for repairing telephone wire, etc., and restoring communication with Battery under shell fire and gas attack.

MORAN, J. ✣ ✣ ✣ ✣

Hammerman, Eastleigh Locomotive Works. Private, Army Service Corps, awarded Order of St. George (Russian) for devotion to Duty. (He died of wounds on the 6th May, 1915.)

MORGAN, A. W. ✣ ✣

Porter, Stores Dept., Nine Elms. Lance-Corporal, Yorkshire Regt., awarded Military Medal. On the 5th July, 1916, when the Horseshoe Trench and its vicinity were being heavily shelled by the enemy after its capture, Lce.-Cpl. Morgan laid a telephone wire to Battalion Headquarters under heavy fire in the open and four times went out to repair it during heavy Bombardment. (Afterwards killed in action).

PALMER, W. J. ✣ ✣

Clerk, Goods Dept., Nine Elms. Private, City of London Rifles, awarded Military Medal for running gauntlet with despatches at second battle of Ypres.

SHORT, H. A. ✣ ✣ ✣

Clerk, Goods Dept., Nine Elms. Captain, Headquarters, Infantry Brigade, awarded Military Cross. When Temporary Second Lieutenant in the Suffolk Regt. and Brigade Bombing Officer during an attack he showed the greatest courage in maintaining the bomb supply and directing carrying parties under heavy artillery and machine gun fire.

SMEDLEY, H. L. ✣ ✣

Solicitor, Waterloo. Lance-Corporal, London Regt. (attached 140 T.M.B.), awarded Military Medal for working trench mortars under heavy fire on April 30th, 1916

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London, Brighton and South Coast Railway staff who have gained honours in the field has increased, and there has been prepared a second Roll of Honour upon which their names and achievements, with the distinctions conferred upon them, are recorded. Capt. Foot (clerk) and Major Hutchence (chief clerk) have been decorated with the Military Cross; Sapper Cook (engine cleaner) and Private Lloyd (driller) have been awarded the Military Medal; Able Seaman Copperwheat (greaser) has gained the Distinguished Service Medal; and Distinguished Conduct Medals have been conferred upon Sergt. Hayes (labourer), Private Heasman (labourer), Corpl. Ingram (assistant fitter), Bombadier Kemp (carriage cleaner), Gunner Smith (gas filler), Private Wall (clerk), Sergt.-Major Ward (assistant ganger), and Sapper Williams (wagon-maker). Lieut. Tronche (electrical engineer) has gained the Croix de Guerre of France. There is every reason for the staff of the London, Brighton and South Coast Railway to be proud of such a fine record.

In regard to the Caledonian Railway, the latest records show that 3,594 members of the staff have enlisted; of these 266 have been killed in action or died of wounds or disease, 283 have been wounded, 30 are known to be prisoners of war, and 40 are reported missing. Of former Caledonian Railway men 45 now hold commissions and 21 have gained distinctions.

Since the outbreak of war 1,707 of the staff of the Glasgow and South Western Railway have joined His Majesty's forces, equal to 17·77 per cent., and of these 88 have been killed in action, while 29 have died of wounds and sickness. Thirteen have been awarded decorations or been mentioned in despatches. Figures provided by the North British Railway show that no fewer than 3,639 of the employees, equal to about one-seventh of the whole staff have joined one branch or another of the forces, and it is to be regretted that 295 have been killed or have died on war service.

There is always a natural reticence on the part of those who have obtained special distinction for valour on the field of battle which makes it very difficult to get any information from them as to the facts, consequently the new poster which is being issued by the London and South Western Railway as a permanent record of the brave deeds for which members of the staff serving with His Majesty's Forces have been decorated, will be welcomed. As will be seen by the reproduction in miniature, on page 285, the poster is a fine specimen of emblematic art, strong in treatment, yet sufficiently restrained to be quite in keeping with such a dignified subject. The arrangement is a designed border in monochrome effect, surmounted by the arms of the railway, supported on one side by the Union Jack and on the other by the White Ensign, with the name of the railway in scroll. A subdued pattern of roses, shamrocks, and thistles, edged by pretty borders of oak leaves and acorns, together with trident and sword—all of national significance—form the background for a series of decorative panels, linked together by entwined laurel. These panels contain vignettes of actual war incidents, excepting the corner subjects, which are of railway interest, suggesting traffic, locomotive, engineering and marine departments. The title is in gold lettering, and the remainder of the letterpress in crimson lake and black. London and South Western Railwaymen who have joined the colours number no fewer than 4,612.

Lord Faringdon, presiding at the annual meeting of the Great Central Railway, ventured to think that particulars of the war service of the Company's staff would interest the proprietors. The particulars provided and the remarks made by the Chairman were as follows:

The total number of Great Central Railway staff employed at the end of July, 1914	34,505
Number of staff who have joined the Colours to February 10th, 1917 ..	7,686
or ..	22·27%
Of these 500 have been killed; 55 are missing; 128 are prisoners and 935 have been wounded	1,618
Number of officers and staff who hold Commissions	109

Our records show that the following number of officers and staff have been decorated for Distinguished Conduct or mentioned in Despatches:

Distinguished Service Cross	3
Distinguished Service Order	1
Military Cross	1
Military Service Medal	2
Meritorious Service Medal	3
Distinguished Conduct Medal	8
Military Medal	15
Mentioned in Despatches	7
	40

Number of females engaged and the grades in which they are employed:

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In clerical capacities	2,000
Goods Porters	475
Passenger, etc., Porters	226
Engine Cleaners	153
Carriage Cleaners	205
Munition Workers	213
Other capacities	998
	4,270

The working of our system, continued Lord Faringdon, has not been easier during 1916 than in the previous year. The movement of traffic has been greater, and further inroads have been made into our already depleted staff. Our General Manager—Sir Sam Fay—has accepted the position of Director of Movements, and his duties at the War Office have prevented his being with us to-day. He, however, is still able to devote a considerable amount of time to the Company's affairs. Our Superintendent of the Line—Mr. Clow—has taken up railway duties in France, where, I am sure, from what I know of his energetic methods, he will do good work.

Every member of the staff, and all our employees, have done their level best to make things work as smoothly as possible.

In reply to questions, the Chairman said that, with a view to encouraging the production of food, they allowed their land to their employees on very reasonable terms. The Company would do everything possible to assist the production of food-stuffs in the country.

The advances in pay to men serving with the Colours went on just the same as to the men at home.

Many RAILWAY MAGAZINE readers, particularly those at Stratford works, will be pleased to hear that Lieut. William G. Scotcher has recently been sent home from the front on short leave to be decorated by His Majesty the King at Buckingham Palace with the Military Cross. He has, as an observer in the Royal Flying Corps in France, had some very narrow and exciting escapes from the enemy in the air. Mr. Scotcher is a recent apprentice from the Great Eastern Railway locomotive and engineering works, Stratford. He is also the youngest freeman of the City of London, and the youngest Associate of the Institution of Mechanical Engineers to be decorated by the King with this present war honour.

At the end of February, 1917, the number of the Cambrian Railways' employees serving with the colours was 372. Unfortunately 10 have been killed and 28 wounded in action. Private F. Phillips, formerly a goods clerk at Oswestry, was awarded the Military Medal for bravery on the field, but we regret to state that he has since died. Reliefman W. E. L. Jones has been mentioned in despatches by Sir Ian Hamilton in connection with operations in the Dardanelles.

The smaller railways of Great Britain have not, in proportion to their sizes, been behind the great trunk lines. Take the Wirral Railway, for instance. This little line has already lost five of its staff by death in action. Their names are Frederick Foster, Frank Dodd, J. H. Little, A. O. Williams and L. McLoughlin. Another of the Wirral Railway staff, Charles Chapman, is a prisoner of war in Germany.

Much has been done by our railways and their employees in connection with the Great War, not only in active contribution to the fighting forces, and their equipment and transport, but also in helping to alleviate the sufferings of, and provide comforts for, the gallant men wounded and maimed in the service of their King and country. As RAILWAY MAGAZINE readers will know, the War Seal Foundation, inaugurated by Mr. Oswald Stoll, has as its object the provision of homes for such men, and this is being strongly supported by railway men. In this cause, a grand concert was recently given at Queen's Hall, Langham Place, W., by the London District Goods Staff of the Great Western Railway. The chair was taken by the retired District Goods Manager, Mr. Henry C. Law, supported by other officers of the Company, and a large and appreciative audience enjoyed the excellent programme provided. From this effort the War Seal Foundation benefits to the extent of £190, and the result reflects great credit on the organiser, Mr. George Bolton.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives will, in future, in no case be answered, neither should queries be of purely local interest.

Broad Street Station.

Although the relations between the London and North Western and North London Railways is now a very close one, Broad Street passenger station belongs partly to each of these companies, and is only reached by London and North Western trains in virtue of running powers over the North London Railway from Camden Town. Through London and North Western passenger trains do not run from Broad Street further than to Watford, on the North Western main line, although prior to the War a fast restaurant car train, known as the "City to City Express," ran daily for some time between Broad Street, Birmingham and Wolverhampton. From the adjacent Broad Street Goods station of the London and North Western Railway, however, fast through goods are worked with express engines direct to the North of England and Scotland nightly.

[Reply to J. A. Moir.]

Lancashire and Yorkshire Railway Running Powers.

The Lancashire and Yorkshire Railway has running powers over the London and North Western Railway from Ardwick Junction, Manchester *viâ* Stockport to Macclesfield, but these are not, nor, so far as we can ascertain, ever have been exercised. The former company has no powers between Stockport, Wilmslow and Crewe, the through working in this case being subject to agreement between the two companies. The Lancashire and Yorkshire Railway does not in normal times work its Manchester–Scarborough through trains beyond York, and the Halifax–Bridlington service is worked throughout by the North Eastern.

[Reply to J. Bond.]

Great Northern Railway Goods Service to Manchester

The Great Northern Railway's goods service to its Deansgate Goods station at Manchester and the Huskisson Depôt at Liverpool is worked by two routes. The trains start from King's Cross (goods) and certain of them follow the Great Northern main line to Retford and thence the Great Central Railway's East to West route *viâ* Sheffield and Guide Bridge, while others travel from Grantham to Sheffield *viâ* Colwick (Nottingham), Leen Valley Junction, Annesley Junction, and thence over the Great Central main line to Sheffield. The remainder proceed *viâ* Grantham and Colwick, thence to Leen Valley Junction by the outer circle line avoiding Nottingham, Awsworth Junction, and Brinsley Junction, where they cross on to the Midland main line in the Erewash Valley just south of Codnor Park station. The rest of the journey is made *viâ* Chesterfield, Dore South Junction, Edale, Chinley and Cheadle Heath. There are, in normal times, three trains in each direction nightly by the Midland route, and four by the Great Central routes, one in each case serving Liverpool: all of these are worked throughout by Great Northern engines and men.

[Reply to J. Bond.]

Great Western Railway Locomotives.

The 4–6–2 engine No. 111, *The Great Bear*, was built at Swindon in 1908. At the present time we understand she is working regularly on the 1.0 p.m. from Paddington to Bristol, and the 4.45 p.m. from Bristol to Paddington *viâ* Badminton—in each case a 2¼ hours' train with an intermediate stop at Reading. No. 100, *William Dean* (now No. 2900), has always had the 4–6–0 wheel arrangement, and was built in 1902. We believe trials were carried out between this engine and the French compound "Atlantic" *La France*.

[Reply to John Lamb.]

The Earliest British "Atlantics."

The pioneer engine of the 4–4–2 wheel arrangement in these islands was No. 990, of the Great Northern Railway, designed by Mr. H. A. Ivatt and built at Doncaster in 1898. Mr. J. A. F. Aspinall's inside-cylinder "Atlantic" No. 1400 followed on the Lancashire and Yorkshire Railway in 1899.

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We should imagine that the honours as to the largest boiler about the period 1904–5 were divided between the 4–6–0 engines 49 and 50 on the Caledonian Railway and Mr. Wilson Worsdell's first "Atlantic" engines of Class V. on the North Eastern Railway, introduced in 1903.

[Reply to JOHN LAMB.]

Urie 4-6-0 Type Engines.

Providing the following information concerning Mr. Urie's 4–6–0 London and South Western Railway engines must not be taken as a precedent :—

	Nos. 482—485 Schmidt superheater.	Nos. 486—489 Robinson superheater.	Nos. 490—491 Non-superheater.
Cylinders, diameter and stroke (in.)	21 by 28	21 by 28	21 by 28
Driving wheels, diameter (in.)	72	72	72
Heating surface, tubes (sq. ft.)	1,759	1,716	2,025
„ „ firebox (sq. ft.)	167	167	167
„ „ superheater (sq. ft.)	394	371	—
„ „ total (sq. ft.)	2,320	2,254	2,192
Grate area (sq. ft.)	30	30	30
Working pressure (lbs. per sq. in.)	180	180	180
Boiler (internal diameter, smallest ring, in.)	66	66	66
Total weight of engine in working order (tons)	79·2	79·2	79·2
„ adhesion weight (tons)	58·6	58·6	58·6
Total weight of engine and tender (tons)	136·6	136·6	136·6
„ length „ „ over buffers (ft.)	65·6	65·6	65·6

[Reply to C. T. HUTTON.]

Locomotive History.

Are there any particulars available of the results of the experiment with the London and North Western locomotive which was converted into a Mallet compound about 1878, and which worked on the Ashby and Nuneaton Section of that line. What was the running number of the engine ?—the two passenger engines regularly working this section in the early '80's were Nos. 1830 and 1841—was it either of these ? Could Mr. Ahrons say what happened to this engine after it ceased to work on this section ?

In reply to these queries Mr. Ahrons writes : The first London and North Western Railway compound engine (two-cylinder) was an old "Trevithick" or "Allan" 6 ft. single, altered in 1878 by Mr. Webb. The cylinders 15 in. by 20 in. of the original engine were modified to one 9½ in. H.P. and one 15 in. L.P. The engine was stated to have been the old *Medusa* built in 1846. The name had been removed some years before, and the number of the engine had become 1830. It was either at this time or shortly afterwards again re-numbered 3088. No particulars were, as far as my knowledge goes, ever published of the results obtained. A further alteration to this engine was again made some years afterwards, when it was tried as a triple expansion locomotive with three cylinders 9½ in., 13 in., and 19½ in. dia., and was named *Triplex*, and finally it was broken up about 1904. I regret that I do not happen to know what work it did in its last state, nor whether it remained a triple expansion engine to the last.

[Reply to W. T. HALL.]

Distance, London to Liverpool.

The figure cited as the distance from Euston to Lime Street may have been reckoned by the original route *viâ* Birmingham (before the Trent Valley line was opened from Rugby to Stafford), when the actual distance was 201⅛ miles. The present distance from Euston direct to Edge Hill is 192¼ miles, and to Lime Street 193⅝ miles. There is a steep descending grade from Edge Hill to Lime Street, and the normal time allowance in each direction is 4 or 5 min.

[Reply to C. E. G. FILLMORE.]

"DX" 0-6-0 Goods Engines, London and North Western Railway.

The prefix "DX" indicates the official works designation of these locomotives. The engines of this type have had a long and honourable history, being built at various times from 1860 to 1872 to the designs of Mr. S. Ramsbottom, and subsequently rebuilt completely by Mr. F. W. Webb, but we are not aware how many of the class are still extant. At the time of re-building, each engine was fitted with the vacuum brake, and the class as a whole, in addition to hauling ordinary goods traffic, has taken a considerable share in the working of excursion and other passenger trains, being capable of remarkably smart running. They have 5 ft. 3 in. wheels, 17 in. by 24 in.

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cylinders, 1,075 sq. ft. heating surface, and 17·1 sq. ft. grate area, and weigh 31 tons in working order. Fifty of the earlier engines were named, but the names were removed on re-building.

[Reply to J. R. WHITAKER.]

Signals near Pilmoor, North Eastern Railway.

We are indebted to Lance-Corporal R. J. Purves, whose photographs have so often illustrated the RAILWAY MAGAZINE, for an explanation of the row of four signals which may be seen on the left of the North Eastern main line (travelling North), at a point about a mile south of Pilmoor station, the signals themselves abutting on the single line from Pilmoor to Boroughbridge and Harrogate. These signals are not, as the querist ingeniously suggested, stored thus handy to the main line in case of a failure of the automatic signalling that extends from Alne to Thirsk, but are specially erected for the practical sight testing of the men. Men failing under the ordinary doctor's sight test are sometimes accepted after a special test on these signals at Pilmoor.

[Reply to E. S. WILLSON.]

Electrified London Suburban Railways.

Although the adoption of varying methods of electrification by the different railways serving the suburban districts of London may appear to be a drawback, as regards future interworking, it must not be forgotten that the electrical operation of railways is still largely in an experimental stage, so that by the use of these differing methods valuable experience is being acquired as to which are the most economical and satisfactory systems. As regards through working, there has of late years been but little interchange of passenger trains between companies round London, most of the lines keeping strictly to their own "parish," and there is no reason to suppose that interchange of this character will increase in the future, save between certain of the tubes and the surface lines. In the latter cases, of course, interchangeable systems of electrification are essential.

[Reply to R. S. WALTON.]

Train Resistance on Curves.

Friction on curves is dependent on four varying quantities, *i.e.*, the radius of the curve (R), the gauge of the rails (G), the length of fixed wheelbase (L), and the weight resting upon the wheels (W). Morrison's well-known formula gives the resistance in lbs. per ton, assuming C to be the co-efficient of friction between wheels and rails, as $\frac{WC}{2R}(G+L)$ in the case of four-wheeled stock, and $\frac{WC}{3R}\left(\frac{G}{2R}+L\right)$ in the case of six-wheeled stock, the wheelbase being rigid in each instance. In a bogie vehicle, of course, the wheelbase of each bogie is considered, four or six-wheeled as the case may be, and not the wheelbase of the whole vehicle, and W then represents *one-half* the total weight of the coach. The major part of this curve friction is due to the fact that the wheels on the outer side of the curve require to travel a longer distance than those on the inner side, and by the difference between these two distances the wheels on one side or other, being fixed on the axles, must slip along the rails. Thus the sharper the curve, the greater the friction loss. C, the co-efficient of friction, varies considerably according to weather and other conditions, but the *average* resistance, in lbs. per ton, of a four-wheeled vehicle or bogie of 8 ft. wheelbase, running on the standard (4 ft. 8½ in.) gauge, is as follows with curves of varying radius :—

Radius in chains:	5	10	15	20	40	60	80
Radius in ft.:	330	660	990	1320	2640	3960	5280
Resistance, lbs. per ton:	10·60	5·48	3·65	2·74	1·37	0·91	0·69

The disproportionately rapid increase of resistance with an increase in the sharpness of the curve is thus obvious. Resistance at the same time decreases with the gauge, and narrow-gauge tracks can thus be laid to a much sharper degree of curvature.

[Reply to C. T. HUTTON.]

The Weir Feed-water Heater and Pump.

This apparatus has three parts, first, an independent boiler feed-pump, usually fixed on the side of the firebox; second, a cylindrical exhaust steam feed-water heater, attached horizontally on the top of the boiler, or on the running plate at the side of the smoke-box; and third, a direct contact live steam feed-heater at the point on the top of the boiler where the water is discharged into the latter. The pump passes the feed-water to the cylindrical heater, which is operated with exhaust steam, and from there the feed is passed through the live steam heater, which sprays the water into the steam space of the boiler. Thus, independent of the degree of temperature to

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which the feed-water has been heated in the exhaust steam heater, by passing through the boiler steam space in a finely divided and attenuated state, it is raised by the steam approximately to boiling point before it enters the body of water in the boiler.

[Reply to C. T. HUTTON.]

Speed Possibilities on the 3 ft. 6 in. gauge.

It is not possible for similar constructional conditions to exist on the 3 ft. 6 in. as on the 4 ft. 8½ in. gauge. This is mainly due to the necessity of keeping the centre of gravity of narrow-gauge locomotives as low as possible, for the sake of stability, owing to the reduced length of the "base" on which they stand transversely. On the other hand, the retention of driving wheels of a suitable diameter for high speed would, by their being brought closer together on the narrow-gauge, tend to force the boiler of the engine upwards, and so raise the centre of gravity of the locomotive. Consequently the much reduced diameter of driving wheels on the 3 ft. 6 in. gauge, not generally exceeding about 5 ft., does not allow of high speeds, while the sharper curves usually met with on narrow-gauge lines, as mentioned in the last answer, would also render high speed inadvisable. The highest speeds run on the narrow-gauge are probably those of the Java State Railways, over which the mail trains maintain an average of 43½ miles per hour for a distance of 515 miles continuously, and thus have to run considerable distances at speeds in excess of 50 miles per hour.

[Reply to C. T. HUTTON.]

The Southampton and Winchester, Great Western Junction Railway.

This was a scheme, promoted in 1901, for the construction of a railway, some 14 miles in length, from Winchester to Southampton, giving the existing Didcot, Newbury and Southampton Railway independent access to Southampton. After a long and severe Parliamentary fight, caused by the opposition of the London and South Western Railway Company, powers were obtained for the construction of the railway (Southampton and Winchester, Great Western Junction Railway Act, 1901). Later, owing to financial difficulties, the scheme had to be abandoned. Recent events have, in the opinion of supporters of the scheme, clearly shown the great use it would have been had it been constructed.

[Reply to RICHARD F. L. TYRRELL.]

Cape to Cairo Railway.

It was Cecil J. Rhodes who conceived the idea of a transcontinental railway which should run as far as possible through British-owned territory and serve as a link to bind together the various sections of British Africa. The economic value of the line will probably depend almost wholly on branch railways feeding it. The direct distance between Cairo and Cape Town is about 5,700 miles. By the end of 1910 the railhead from the north, but for the river gap between Assouan and Wadi Halfa, was at Sennar—about 1,500 miles. From Cape Town the South African section had in 1906 reached Broken Hill—2,017 miles. A further extension—132 miles—of this section to the Southern border of the Belgian Congo territory was completed in 1909. From the Congo Border the Belgians have carried the line a further 324 miles northward *viâ* Elizabethville to Tchilongo on the way to Bakama. The rails now reach from Cape Town to Tchilongo, a total distance of 2,473 miles.

[Reply to J. JOHNSON.]

Rebuilt Midland 4-4-0 Johnson Engines.

Mr. C. Hylton Stewart writes: "Midland Railway 301–328 are unrebuilt Johnson 4–4–0's, saving about half a dozen which have been scrapped. Engines of this type are stationed at Liverpool, and regularly work to Hellifield."

[Further reply to T. G. FENDICK.]

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PERTINENT PARAGRAPHS

Our Colour Plate.

As frontispiece to this (April) number of the RAILWAY MAGAZINE, readers will find a colour picture, reproduced from an oil painting of a new passenger tank engine (No. 114) which has just been completed at the Stoke Works of the North Staffordshire Railway. The engine was designed by the late Mr. J. H. Adams. It is of the 0-6-4 type, and differs from the "C" class in that the coupled wheels are 5 ft. 6 in. diameter instead of 5 ft. The new engine has a boiler 4 ft. 10⅛ in. at its largest diameter, and 11 ft. 2¼ in. long between tube-plates, with a Belpaire firebox 7 ft. long outside, 4 ft. 11⅜ in. wide at top, and 4 ft. 0½ in. at the bottom, the grate area being 21 sq. ft. It is fitted with a Robinson Superheater, the heating surface of the superheater tubes being 258 sq. ft., and the flue tubes 887 sq. ft., while the firebox provides an additional 129 sq. ft., making the total heating surface 1,274 sq. ft. Ross Patent "Pop" safety valves, 2 in. diameter, are set to carry a working pressure of 160 lbs. per sq. in. The cylinders are 20 in. diameter with a stroke of 26 in., and have piston valves 8 in. diameter. Lubrication is effected by means of two Wakefield patent mechanical lubricators feeding the coupled axleboxes, piston valves and cylinders. The Wakefield Patent Anti-Carboniser is applied to the feeds supplying the valves and cylinders, by which we understand the formation of carbon deposit is obviated. The coupled wheelbase is 16 ft. equally spaced, and that of the bogie is 5 ft. 6 in., its centre being located 9 ft. behind the centre of the trailing coupled wheel. The tanks have a capacity of 2,250 gallons of water, while the bunker holds 3½ tons of coal. The total weight in working order is 77·35 tons, of which approximately 55·5 tons are carried on the coupled wheels. The engine is also furnished with a feed-water heater, and it has on the vacuum brake ejector a steam brake valve by which the steam brake is actuated on the engine coupled and bogie wheels. We have to acknowledge with thanks the courtesy of the present Locomotive Engineer of the North Staffordshire Railway, Mr. J. A. Hookham, for the particulars given. A very fine colour plate is in preparation for the May RAILWAY MAGAZINE.

Port of Goole.

CONCERNING the Port of Goole an important letter has been addressed by the Lancashire and Yorkshire Railway Company to the Chamber of Shipping of the United Kingdom, wherein the Chamber is requested to call the attention of its members to the facilities offered by the Port of Goole. Mr. John A. F. Aspinall, the general manager, points out that in these times of difficulty of distribution it seems a great pity that a port like Goole, which is well equipped for dealing with railway work, and did during times of peace a large volume of trade with the Continent, should now be almost deserted. He states that Goole possesses not only ample appliances for the purpose of loading and discharging ships, but is fitted with coal tips for cargo and bunkering purposes which can deal with considerable quantities of coal per hour at as high a rate of speed as the machinery in any other well-equipped port. If, he says, there is any difficulty created by an increase of tonnage as regards labour, this could be met by using labour from the labour battalions. The whole of the company's fleet, which used the port, has been taken over by the Admiralty, and the railway's agents at Rotterdam and Amsterdam have only to a limited extent been running steamers regularly to the port. He adds that the immediate effect of a fresh call for the export of coal from Goole would be that the barge system of the Aire and Calder Canal would again be brought into operation and would to that extent relieve the demand for railway wagons.

Lord Farrer and Future Fares.

AT the recent annual meeting of the proprietors of the London Electric Railway, the Chairman, Lord Farrer, in reference to the extension of the train service to Watford in connection with the London and North Western Railway, also dealt with the question of fares. He remarked that the extension had been delayed on account of the difficulty of obtaining the necessary joint rolling-stock. He was glad to say, however, that arrangements had now been made for the company temporarily to supply rolling-stock on reasonable terms, and it was anticipated that the through service could be initiated sometime in April. The results shown by the Queen's Park extension and the through running to Willesden had, even in these abnormal times, been excellent, so they anticipated further improvement from the extension to Watford, although the 50 per cent. increase of fares on the main line railways ordered by the Government would undoubtedly retard the development of the traffic. In this connection he might say that they had often had suggestions from the shareholders that the fares should be increased. There were, however, two

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things to be remembered. First, they were a great public utility company, and must consider a matter of this kind from the point of view of the public interest as well as that of revenue-earning power; and second, all their past experience had shown that in their area the best way to secure the largest net revenue was to obtain a large volume of traffic by low rates, coupled with quick and frequent service, rather than fewer passengers at high rates. At the same time they were quite aware that a new factor had entered into this problem, owing to war conditions, one of which was the falling purchasing power of money. If the price of all the commodities they had to buy continued to rise, measured in money, then it was obvious that the commodity they had to sell, viz., transportation, ought not indefinitely to remain stationary. A re-adjustment of fares under these circumstances would be justifiable as a restoration rather than an increase in the scale of rates.

What a Great Snowstorm means to a Railway.

ALTHOUGH the events narrated took place in March, 1916, they were so very remarkable that RAILWAY MAGAZINE readers generally will heartily approve of the action of Mr. G. Murray Smith, Chairman, Midland Railway, in putting on record the experiences of the Midland Railway staff in dealing with the effects of the great snowstorm of that date, and all will agree that his praise of the Midland Railway officers and staff was thoroughly well earned. At the general annual meeting where public acknowledgment was made of their excellent work, Mr. G. Murray Smith remarked: The great snowstorm affected the railway from London to Leeds, and from Derby to Cheltenham, though the 75 miles from Bedford to Derby, and especially about Kettering, bore the brunt of the storm, for there the wind blew with hurricane force. Though we know only too well what such a storm means to each one of us personally, it is not so generally known what it means to a railway company. To the passengers travelling that evening it meant a night spent in a train instead of at home, and the arrival at their stations many hours after the advertised time, with all the attendant inconveniences, but at any rate in safety. To the railway company it meant 1,197 telegraph poles blown or broken down or leaning in all directions. No poles—and all our poles are strong and sound—could stand against such a wind with the weight of the many snow-covered wires. For instance, at Wellingborough a foot of galvanised iron wire—the normal weight of which is 1¼ ozs.—was found to weigh, with the hard-packed snow upon it, 16 lbs., so you can imagine the many tons each pole had to carry. Nine thousand miles of wire had to be replaced and renewed, and nearly all the block system, telephone, and telegraph wires from Bedford to Derby were broken, while the cost to the Company was from £40,000 to £50,000. A word of praise must be given to Mr. Sayers (the Telegraph Engineer) and his staff for the way in which they grappled with this catastrophe. They worked under the most trying conditions, for, in addition to the damage the blizzard had caused, they were handicapped by both main lines north of Kettering being snow-blocked, and on two mornings the line was enveloped in the thickest of fogs, and to thoroughly complete their trials there were four successive Zeppelin raids, during which work had to be suspended. Nevertheless, they had completely re-established the block signalling system by temporary means—such as fastening the wire to bridges, hanging it on fences, and various ingenious ways—in a week's time. Though to place the line in the same position as it was before the storm will take, owing to the shortage of labour—for the telegraph construction staff is reduced by 40 per cent.—many months to carry out. Those were the trials and troubles of the Telegraph Department, but the Traffic Department also had its troubles, for with trains fast in the snow and all means of communication cut off, for a time all traffic was suspended. However, by the evening of March 28th the traffic was moving, and every day saw an improvement in the volume of traffic, though it was worked with great difficulty and some anxiety until at the end of a fortnight the normal passenger and freight train service was resumed.

Lord Faringdon on Great Central Finance.

THAT the Great Central Railway, under the able and enlightened control of Sir Sam Fay, is a well-managed line is well known to RAILWAY MAGAZINE readers, but as the proof of pudding is in the eating, so is the evidence of good railway working found in its financial results. Lord Faringdon, as Chairman, at the recent annual meeting of the proprietors of the Great Central Railway, said the net receipts, after adjustment of compensation under the Government agreement, were (including miscellaneous items), £2,226,910, representing an increase of £27,306 over the preceding year. £7,214 was brought forward, and the total enabled them, after paying 2 per cent. upon the 1894 5 per cent. preference, to carry forward £8,367. Their total traffic receipts were £7,607,966 and the total net income was about £27,300 above the preceding year, due mainly to the new arrangement regarding the compensation payable to the railway companies during the period of Government control. Turning to the general balance sheet, his lordship pointed out that the Lloyd's bonds had been reduced by £106,000, their pension fund increased by £39,000, and the depreciation funds were greater by £423,000. Those depreciation funds now amounted to £1,342,865. Of course, a great deal of that amount represented repairs and renewals, which, owing to the war, it had been impossible to carry out. When normal times returned much of the money would be required for dealing with arrears of maintenance, renewal of rolling-stock, machinery, etc. Meanwhile, they were doing their utmost to keep the whole line and its equipment in the best order possible. Their improved cash position had

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justified the directors in subscribing £250,000 to the new War Loan. Speaking from the chair at the beginning of 1900—shortly after he joined the Board—he remarked: "Until your finances are placed on a thoroughly satisfactory basis, a good deal of the time that I devote to the affairs of your company must be given to finance." He thought that day was an appropriate opportunity for reviewing the company's position and comparing it with the state of things at the beginning of 1900—soon after the opening of the London Extension Line.

Lord Faringdon then cited figures showing how out of the depths of the "financial whirl" of the 1900 period, the directors had been able to bring the undertaking into a very strong position. Indeed, he did not think any railway company was in a better financial position that day than the Great Central. For example, they had in 1900 an overspent capital account of £4,520,000, which had been reduced to £2,575,000; they had (in 1900) unfunded liabilities consisting of Lloyd's bonds, rolling-stock certificates and wagons purchased on deferred payments amounting to £6,000,000; and that had been now reduced to £481,000, and would disappear altogether shortly. Moreover, in 1900, they had expended on capital account £46,081,000. According to the figures given in the present accounts that expenditure had grown to £57,189,000—an increase of £11,108,000. A grand total of £19,485,500 has been raised in 17 years for their undertaking. Some of it has fructified already, but there was a good deal that was only beginning to show a return, and a long time must elapse before a reasonable harvest was reaped upon the whole of the capital sown. A new line of railway, or a new port, took years of careful nursing and development before realising the expectations of its promoters.

Mismanagement of an Irish Railway.

SOME very pertinent questions were recently asked in the House of Commons as to what steps had been taken to remedy the mismanagement of the Burton port Extension Railway, a railway built and equipped with public money; whether much of the irregularity was due to the insufficiency and defects of the working company's engines; whether the Irish Railway Committee had had before them any proposals to deal with the situation so as to ensure sufficient engine power and rolling-stock; and, if so, when might the people expect an improvement in the service.

In reply, Mr. Baldwin (Lord Commissioner of the Treasury) stated: The Burtonport Railway is worked, managed and maintained by the Londonderry and Lough Swilly Railway Company under an agreement with the Treasury under the Railways Act, 1896. The Commissioners have had many and serious grounds for complaint of the mismanagement of the line by the company, and in the year 1915 had to take legal proceedings against it. The Commissioners, after very careful consideration, came to the conclusion that the application of the powers given to them by the Act of 1896 could not satisfactorily meet the causes of complaint which seem inseparable from the present administration of the Lough Swilly Company. The present highly unsatisfactory condition of affairs on the Burtonport Railway is due to the mismanagement of the Lough Swilly Railway Company, and particularly to their neglect, even before the war (1) to keep the locomotive stock in proper working order, and (2) to maintain an adequate and efficient staff. In May last the Commissioners, in consequence of complaints, sent their engineer to inspect the locomotive stock, and on his report the company were called upon to put the stock into repair. Owing to the neglect of the company to keep up its supply of materials and a proper staff, it was unable to do the work itself, and engineering firms to which it applied being "under control" were unable to do the work without the consent of the Ministry of Munitions. An application in which the Commissioners joined was made to the Ministry without success. The Commissioners understand that the Executive Committee, which has been made acquainted with the facts has, on the urgent request of the company, recommended the Ministry of Munitions to agree to the supply of a repairing staff. Till the result of this application is known it cannot be said when an improvement will take place, but meanwhile the Commissioners have taken steps with a view to securing that at any rate the line shall be kept open.

London and North Western Railway's Fleet.

THAT there is considerable public interest in the fate of railway steamships requisitioned by the Government is well-known at the office of the RAILWAY MAGAZINE, and we are therefore confident that the information given by Sir Gilbert Claughton at the annual meeting of London and North Western Railway proprietors concerning the railway's cross-Channel fleet will interest a much wider audience. "The Government," said Sir Gilbert, "took soon after the outbreak of war, four of the largest steamers, viz., the *Hibernia*, *Anglia*, *Scotia*, and *Cambria*, two of which, as I informed you last year, had, unfortunately, been lost, the *Hibernia*, which had been re-named the *Tara*, having been torpedoed by submarines, and the *Anglia* having been sunk by a mine. The Government also took over the Fleetwood and Belfast steamers, the *Duke of Albany* and the *Duke of Cornwall*, in which this Company is interested jointly with the Lancashire and Yorkshire Railway, and I regret to say the *Duke of Albany* has been lost, having been torpedoed on August 24th last, when unfortunately five members of the joint staff lost their lives. The Government have, of course, admitted their liability for the loss, as they did in the case of the *Hibernia* and *Anglia*. I am sorry to say that the Company's steamer *Connemara*, soon after leaving Greenore for Holyhead on November 3rd last, collided with the s.s. *Retriever*, and foundered with all on board with the exception of one member of the crew.

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The *Connemara* was fully insured through Lloyd's. You may remember the circumstances under which the crew of the *Tara*, after she had been sunk by submarines in the Eastern Mediterranean, were landed and taken prisoners by the *Turks*. Of the crew 89 were North Western men, *10 of whom* lost their lives when the boat was torpedoed, and one afterwards died. Five others died of disease during captivity, and the remainder, together with naval members of the crew, were rescued at the "Wells of the Hakin Abiat, Libyan Desert, Tripoli," after a brilliant dash carried out by a raiding party in motor cars, under the command of the Duke of Westminster. During captivity the men suffered severe privations owing to the scarcity of food, but, *eventually* brought back to Holyhead, nearly all *have rejoined* the Company's service."

Underground Social Welfare.

HIGHLY commendable concern in the social and material welfare of its staff is one of the leading characteristics of the ruling powers on the UndergrounD railways of London. Recent evidence of this excellent trait in railway management is the establishment of a luncheon and Social Club for the women employed on the Administrative Staff of the UndergrounD Railways at Electric Railway House, St. James's Park, S.W., and Oxford Circus Ticket Sorting Offices, which is now in use at Earl's Court. The premises were opened by Sir Albert Stanley just prior to his taking over the office of President of the Board of Trade, and in addition to being available for luncheons and teas it is used by the staff for rest and social purposes. As an indication of its utility a very successful concert was recently held, the programme being entirely provided by members of the staff. About 120 members were present, the attendance having to be somewhat restricted owing to the limits of the accommodation of the largest room.

The building consists of five storeys and has a direct entrance for members from Earl's Court station. The basement contains kitchen and domestic offices, the cooking apparatus, which is entirely electrical, consisting of four baking ovens, large boilers and steamer, boiling plates, grill, etc., suitable for cooking 200 meals. A special current cable is run from Earl's Court sub-station for this purpose. Arrangements have been made for additional plant to be supplied at an early date which will enable 250 to 300 meals to be supplied.

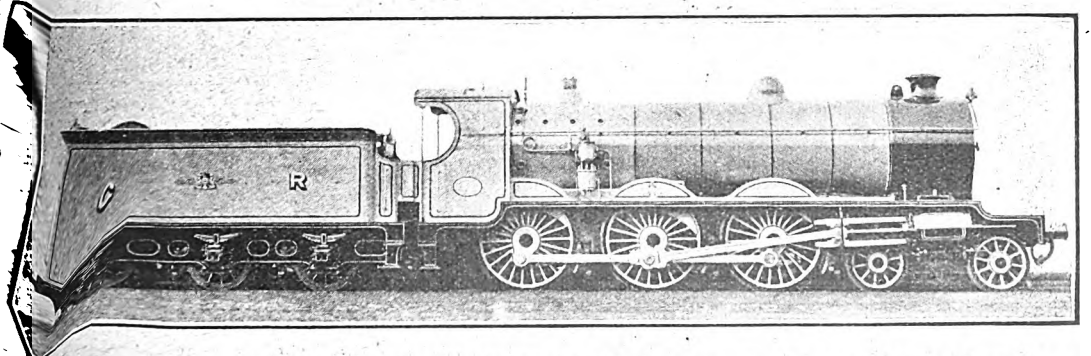
There is also a dining room (with servery) in the basement capable of seating 40 persons, and two dining rooms on the ground floor accommodating another 80, with suitable servery, electrically heated, connected with lift direct to the kitchen. The first floor is taken up by two large comfortable rest rooms and a small library. RAILWAY MAGAZINE readers will find the kitchen and three of the rooms illustrated on page 247.

Luncheons are provided for the female staff at a low inclusive figure, and in order to avoid any tendency to crowd the dining rooms during rush hours, arrangements are made that only a certain number of members arrive at stated intervals.

The alterations to the building and equipment have been carried out by the Architectural Sub-Department, under Mr. Z. E. Knapp, UndergrounD Railway Manager, for Maintenance and Construction. Under the genial guidance of the London Electric Railway Passenger Agent, Mr. S. J. Webb, a representative group of pressmen, including the RAILWAY MAGAZINE Manager, were escorted over the Club and all were loud in their praise of its general excellence and the admirable arrangements made by the railway company for the comfort of its female administrative staffs.

Caledonian Railway 4-6-0 Locomotive No. 62

FROM a photograph furnished through the courtesy of Mr. W. Pickersgill, Locomotive Superintendent, Caledonian Railway, an illustration is here given of the company's latest bogie passenger 4–6–0 locomotive, No. 60 class. For these engines the Robinson superheater has been adopted and Wakefield mechanical lubricators are fitted. The principal dimensions are shown under the illustration.



Centre of boiler from rail, 8 ft. 6 in.; heating surfaces, 1,934·25 sq. ft.; working pressure, 170 lbs. per sq. in.; tractive force, 19,373; cylinders, 20 in. dia. by 26 in. stroke; coupled wheels, 6 ft. 1 in. dia.; wheelbase of engine and tender, 52 ft. 5½ in.; length of buffers of engine and tender, 62 ft. 6 in.; capacity of tender in gallons, 4,200; weight of engine and tender in working order, 121½ tons, fuel space for 6 tons of coal.

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4-6-0 Locomotives, Caledonian Railway.

WE have received such a mass of correspondence on the above subject from various readers that it is well finally to clear up the contentious points raised in last month's "Pertinent Paragraphs," as we are unable to devote any further space to the subject. The present stock of 4-6-0 engines on the Caledonian Railway is as follows, in chronological order of construction :—

Nos.	*Cylinders.*	*Driving Wheels.*	*Duties.*	*Built.*	*Total Engines.*
51-59	Inside, 19 × 26	5 ft.	Oban line	1902	9
49-50	Inside, 21 × 26	6 ft. 6 in.	Express passenger	1903	2
*49-50	Inside, 20¾ × 26	6 ft. 6 in.	Express passenger	later	
903-907	Inside, 20 × 26	6 ft. 6 in.	Express passenger	1906	4
*903-906†	Inside, 20¾ × 26	6 ft. 6 in.	Express passenger	later	
918-922	Inside, 19 × 26	5 ft.	Express goods	1906	5
908-917	Inside, 19 × 26	5 ft. 9 in.	Mixed	1906	10
*179-188	Inside, 19½ × 26	5 ft. 9 in.	Mixed	1914	10
*938-943	Outside, 21 × 28	6 ft.	Mixed	1915	6
*60-61	Outside, 20 × 26	6 ft. 1 in.	Mixed	1917	2

* Superheater engines. † 907 broken up after Quintinshill accident.

In this table we have a total of 48 engines, and excluding the two engines last-mentioned, of which more in the next paragraph, we have a total of 46 engines—the number correctly given in the article written by Mr. Francis in the January issue, although he inadvertently described as Nos. 47 and 48 the engines bearing the Nos. 49 and 50. What many readers have forgotten is the unfortunate fact that No. 907—the last of the large-wheeled 4-6-0's—was broken up after the disastrous collision at Quintinshill in 1915, thereby reducing the number of these engines by one, and settling the point raised by Capt. Chrystal in last month's RAILWAY MAGAZINE.

The Outside Cylinder Caledonian 4-6-0's.

THE misapprehension of certain correspondents concerning the outside cylinder 4-6-0 engines of the Caledonian Railway arises out of the fact that two distinct classes are now in use. Nos. 938-943 are the six 6 ft. superheater engines built by Messrs. Hawthorn, Leslie and Co., Ltd., of Newcastle-on-Tyne, for the Highland Railway, and subsequently purchased by the Caledonian Railway owing to urgent need of locomotives under the pressure of war traffic. Nos. 60-61, however, are the first of an entirely new series of 6 ft. 1 in. superheater engines, also with outside cylinders, built at St. Rollox Works to Mr. Pickersgill's designs. We understand that there will ultimately be six engines of this type, bringing the total number of Caledonian 4-6-0 engines up to 52. By the way, the first of Mr. Pickersgill's new 4-6-2 tank engines is also now running, and is numbered 944; the cylinders are outside, and the whole design is novel for the Caledonian Railway. It is rumoured that these engines will work on the services between Glasgow and the Clyde Coast, freeing the 5 ft. 9 in. 4-6-0 engines for more important main line duties.

4-6-0 Varieties on the Caledonian Railway.

No other British line has so large a variety of engines of this wheel arrangement. There are two distinct series of the 5 ft. engines, the first 9 working on the Callander-Oban line, and the later series of 5, with 5 ft. 3½ in. boilers being confined mainly to fast goods service. The two series of 5 ft. 9 in. engines are practically similar, save that the later series in this case are equipped with superheater and larger smokeboxes and cylinders. Between the two batches of 6 ft. 6 in. express engines there is a distinct difference, the later engines having boilers 5 ft. 3½ in. against 5 ft. diameter, and 17 ft. 8 in. long against 17 ft. 4½ in. in the cases of Nos. 49-50, while the cylinders of Nos. 903-907 were 1 in. less in diameter than those of Nos. 49-50 at the time of construction. Since superheating, however, the cylinders of all these 6 ft. 6 in. engines have uniformly been made 20¾ in. by 26 in. Finally, the two series of outside cylinder 4-6-0's are entirely different, not only from each other, but from all the engines which have preceded them. There are thus eight distinct 4-6-0 types on the Caledonian Railway. We do not consider the title of "mixed traffic" engines inappropriate for the 5 ft. 9 in. and 6 ft. types, as, although they certainly are extensively used on the Coast services, and those between Glasgow and the North, they are probably put to their maximum of use in express goods working, especially at the present time.

Early Caledonian Engines.

OUR contributor, Mr. C. E. S. Littlejohn, sends from Coatbridge, some interesting notes in answer to the queries raised by Mr. G. M. Guthrie in last month's "Pertinent Paragraphs." His impression is that very few remain of the 2-4-0 engines, although he saw No. 1053 recently at Stirling and Nos. 1030 and 1046 (7 ft. class) at Dundee. "As to the 0-4-2's" he continues, "quite a number of them are running, as many of them, including, I believe, all those dated 1878 and 1881, were rebuilt by Mr. M'Intosh. The 0-4-2 of which Mr. Guthrie has a photograph is probably one of the six locomotives built by Neilson, Reid and Co. for the London, Chatham and Dover Railway, and bought by the Caledonian Company, I think in 1868. There were two 0-4-2 tank engines, two 0-4-2 tender engines, and two 0-6-0 goods

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engines. The two last-mentioned were some years ago put on the duplicate list, but were then rebuilt by Mr. M'Intosh and renumbered 381 and 382; I believe they have always worked in the Kirtlebridge district, and are still running. There were five bogie engines designed by Connor with 7 ft. coupled wheels and outside cylinders, built by Neilson in 1877. They were numbered 125–129, and ran for many years between Dundee and Glasgow; in fact they were commonly known as the 'Dundee Bogies.' They were rebuilt by Drummond and the last survivor was No. 1126, which disappeared from service about eight years ago. The 'double-ender' tanks worked in the Glasgow district after being replaced by the 'Oban bogies,' and on the opening of the Underground line to Maryhill they were employed on that section, being specially fitted with condensing apparatus for the purpose. The outside cylinder rebuilds, such as No. 473, were Connor 2–4–0 goods engines rebuilt by Drummond, but I doubt whether any are still at work."

Railway Signal Engineers.

At the first meeting of the Institution of Railway Signal Engineers, held in London on March 6th, the secretary read the fourth annual report, which remarked that the conditions referred to in the proceedings for 1915 still remained and, unfortunately, prevented the carrying out of the work of the Institution to its full extent. A number of meetings were held, and although not largely attended, some interesting discussions took place on the two papers which were submitted. It was satisfactory to note that applications for membership, mainly from overseas, continued to be received, and 13 additional members had been elected during the year, the number now being as follows: Foundation members, 7; honorary members, 7; members, 130; associate members, 62; student members, 10; total membership, 216. The death was recorded, with regret, of Mr. George Neale, of the Hull and Barnsley Railway. It was not yet possible to give a complete list of the members serving with the Forces, but the Council hoped to be in a position to do this at the conclusion of the war, and members were again requested to furnish the necessary information, with photograph, to the secretary.

Automatic Signalling.

In concluding a paper on Automatic Signalling, read at the meeting referred to in the foregoing paragraph, Mr. C. H. Ellison, telegraph superintendent of the North Eastern Railway, recapitulated the following views expressed by Sir Sam Fay: "I am certain that we are approaching a complete revolution all the way round in our system of signalling. What we are now doing is only a commencement. I believe before we are much older we shall see all our intermediate signal boxes worked automatically." As to the future of electricity Mr. Ellison remarked, "I believe that we have not yet even dreamt of what will be accomplished by its use in the future, or the possibilities of the services it will still render to the world and mankind. So far as its application to railways is concerned its extended employment owing to the prolongation of this terrible war has undoubtedly been delayed, but its opportunities will return ere long, and I am confident that the day will come when mechanical signalling will give place to automatic and electrical signalling, when the steam engine will be superseded by the electric locomotive, and when our main lines will be converted from steam to electric railways."

A Closing Chapter in Great Western Railway Locomotive Design.

From Bath, Mr. L. B. Hewitt writes:—"The announcement in the March issue of the Railway Magazine that engines of the $\frac{2\text{–}4\text{–}2}{T}$ type had been condemned and broken up during the past year marks at all events the partial close of another chapter of the history of that company's locomotive design. This intimation presumably refers to the scrapping of the class of locomotives which in the early part of 1901 inaugurated the era of large-boilered tank engines on the Great Western Railway. The first of the class was numbered '11,' but the succeeding engines of the type were numbered in the 3601 series; and 30 of these were built. Under the Great Western Railway's re-numbering scheme of a year or so back No. 11 became No. 3600. These engines were employed on suburban services in the London and Birmingham areas. Presumably they have now been condemned, although comparatively modern, because the various 2–6–2 developments of the design possess greater adhesive effort or tractive power. The most surprising part of this demolition of a comparatively new class is that the much older 2–4–0 and 0–4–2 side tanks are still in constant service all over the system, their numbers practically undiminished."

Locomotive Engineers Entertain Wounded Warriors.

On a recent Saturday afternoon the Institution of Locomotive Engineers entertained at Cannon Street Hotel, London, a party of a hundred wounded soldiers from Guy's and Westminster Hospitals, who were conveyed to the hotel free of charge by the London General Omnibus Company. The function was attended by the Lord Mayor and Mayoress, the sheriffs of the City and ladies. His lordship in a jovial speech remarked: "Soldiers of the King, I want to say how pleased I am to be here to bid you a hearty welcome in the City of London. We are very proud of you—you have fought and suffered for the Empire, and the City of London is glad to recognise such men as you who have made this Empire the great Empire it is. I always think this when I stand in the presence of wounded soldiers, that I am standing in the presence of my

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betters, because they are men that have not only worked—they have suffered for the Empire; and they are maintaining and fighting for a holy and righteous cause, and they are going to win in a holy and righteous cause. It is not necessary to talk to you boys about duty; you know what duty is, and you have performed it. We are not always going to look back; we are looking forward to the time when you come back to the City of London, when peace is proclaimed from the Royal Exchange, and we will give you a hearty welcome; and we want to say a few words to encourage you to bear up until that time."

Mr. A. D. Jones (President of the Institution) extended on behalf of the Institution the heartiest of welcomes to those who were present, to the representatives of the Army particularly. Mr. Jones also mentioned the good work done by the Reception Committee in arranging the entertainment, the idea of which originated with the honorary secretary, Mr. G. F. Burtt, and Mr. C. A. Suffield.

The Late Mr. Walter Bailey.

NOT alone the service in which he was engaged, but the British railway world as a whole has sustained a severe loss by the death on March 1st, at the age of 57, of Mr. Walter Bailey, who

THE LATE MR. WALTER BAILEY.
Chief Accountant, Midland Railway.

had been accountant of the Midland Railway since August, 1904. His was a charming personality and he was one of the most prominent railway accountants of his day and generation. He was previously Accountant of the Belfast and Northern Counties Railway, from February, 1887, until in July, 1903, the line became the Northern Counties Section of the Midland Railway of England. Mr. Bailey commenced in boyhood his career in the offices of the South Eastern Railway at Ashford, and was later transferred to headquarters at London Bridge, whence he succeeded to the Irish appointment. While in Ireland he discharged his onerous duties in a manner which gave the utmost satisfaction to the directors, and which proved highly beneficial to the interests of the shareholders, and he had much to do with the detail work associated with the carrying through of the amalgamation scheme with the Midland Railway. His promotion to the position of still greater responsibility at Derby was only a fitting recognition of his faithful service and of his well-known ability. In his time he did the railway companies much useful work in literature. A few years prior to leaving Belfast he was selected by the Irish railways to reply to the strictures passed by Professor James Long upon the administration and management of railways in Ireland and he presented the case for the railways with characteristic skill.

Mr. Bailey took with him to Derby the best wishes of his colleagues in Belfast, and at the Midland headquarters he abundantly justified all that was anticipated of him both as regards his rare business capacity and his manifold personal qualities. During his tenure of office he was identified with alterations in benefits under the Superannuation Fund, all tending towards betterment, and was also associated with the inauguration of the Savings Bank. He was appointed by the Board of Trade to represent railway interests on the Departmental Committee whose labours led up to the passing of the Railway Accounts and Returns Act, 1911, which metamorphosed the form of accounts issued by the companies, and put the shareholders and public in possession of much fuller information with regard to the working of railways. He was also a member since its inception of the Accountants' Permanent Committee at the Railway Clearing House, and at the time of his death held the responsible position of Chairman of the Accountants' Sub-Committee of the Railway Executive Committee.

The Channel Tunnel.

A FREQUENTLY debated question in railway circles is "What will be the effect of the war on the proposed Channel Tunnel?" Mr. Arthur Fell, M.P., the sponsor of the scheme in the House of Commons, was recently the guest of the Political and Economic Circle of the National Liberal Club, when he spoke hopefully of the time when the London-Bagdad, London-Petrograd, and London-Madrid trains would be running regularly through the Channel Tunnel. Though the boring had been stopped by the order of the military authorities, he had a very shrewd suspicion as to the opinion of the present Prime Minister, whose enthusiasm for France was well known. Therefore, he had not the slightest doubt that if the Committee of Imperial Defence, to whom Mr. Asquith referred the question, reported favourably on the scheme the Government would support it, and it would be carried out.

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WHAT THE RAILWAYS ARE DOING

MR. A. P. ROSS, Assistant Engineer, Great Northern Railway, has been appointed Chief Engineer to the Cheshire Lines Committee in place of Mr. H. Blundell, who has gone to the Great Central Railway as Chief Engineer. Mr. Ross is the eldest son of Mr. Alexander Ross, the immediate Past-President of the Institution of Civil Engineers and late Chief Engineer of the Great Northern Railway. After leaving the University College, London, he joined the Engineer's Department of the Great Northern Railway in 1900, subsequently going as Assistant to Mr. W. Marriott, of the Midland and Great Northern Joint Line, on the construction of the Cromer and Mundesley Railway, and to Mr. Edward Parry in the preparation of drawings, specifications, etc., for the construction of the South Yorkshire Joint Railway, becoming later Engineer for the contractors, Whitaker Bros., for the latter line. Thence Mr. Ross went as Engineer to Charles Wall, Ltd., the contractors for the Metropolitan Water Board's new reservoir at Chingford. Subsequently he rejoined the Great Northern Railway as Chief Assistant to the Chief Engineer, and was appointed Assistant Engineer in 1912. Mr. Ross is a Member of the Institution of Civil Engineers.

* * *

MR. A. P. ROSS, M.INST.C.E.,
Chief Engineer,
Cheshire Lines Committee.

FROM Ramsbottom Mr. E. C. Bourne writes: "The Manchester–Bury electric service continues to work very satisfactorily the 20 minutes' service being still maintained. As far as I know it was not all effected by the frost. Even in the thickest fogs as a rule trains arrived so little late that they were generally able to leave either terminus on time." Mr. Bourne adds, "I should be glad if any RAILWAY MAGAZINE reader could let me know the shed of Lancashire and Yorkshire 2–4–2 tank engine No. 1008."

* * *

A RAILWAY MAGAZINE reader, Mr. Rex Leathley, remarks: "Lytham, near where I live, is on the Preston–Blackpool seaside branch. We have not suffered overmuch by the train alterations. We have lost our only remaining London and North Western train, an afternoon train from Crewe arriving at Ansdell at 3.12, and on the return journey leaving Ansdell at 5.13. This train was most often hauled by a 'Jumbo' or a 'Jubilee' compound. As late as the summer of 1915, I saw 790 *Hardwicke*, that world-renowned 'Precedent,' on this train. Could any of your readers say whether this splendid little engine has gone the way of all engines?"

* * *

A WORCESTER reader, Mr. J. G. Tarrant, kindly communicates as follows: "With reference to the list of new Great Western Railway signal boxes, given in March number, I would like to point out that Blackpole, where one of these boxes has been erected, is between Worcester and Fernhill Heath. Its erection became necessary owing to the construction of sidings in connection with a large factory that is being built there."

* * *

FROM Dublin Mr. R. W. Banks writes: "In reference to the paragraph on page 438 of the December, 1916, RAILWAY MAGAZINE, on the subject of the removal of the names from the Great Northern of Ireland engines, it may prove of interest to you to know that the following have appeared during the last eighteen months or so, painted black, but *retaining* their names: Nos. 113, *Neptune*; 157, *Orpheus*; 126, *Diana*; and 127, *Hercules*, of the larger non-superheater 4–4–0 class. Also, Nos. 170 *Errigal* and 174 *Carrantuohill*, of the 4–4–0 superheater class, retain their names, although they have been painted black. No. 113 *Neptune*, previously mentioned, No. 120 of the Q class, 4–4–0 express, No. 78, Class C 0–6–0 goods, and several others have been fitted with the new pattern of cast iron chimney, in place of the built-up ones originally supplied."

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THE number of Dublin and South Eastern Railway employees who have joined the Army since the beginning of the war is 97. Of these there have been 13 casualties as follows: 7 killed, 5 wounded, and 1 missing.

* * *

MR. HEWITT, Berkhamsted, having written stating that an engine recorded in the March RAILWAY MAGAZINE as stationed at Carlisle was in fact at Camden, our Crewe correspondent replies: "Mr. Hewitt is quite correct. London and North Western engine No. 2395 *J. A. F. Aspinall* is now stationed at Camden. When the paragraph was written the engine was stationed at Carlisle. I saw it frequently at Crewe up to the time it was transferred, which probably occurred during the interval preceding publication of the magazine. The batch of 'Claughton's,' to which No. 2395 belongs, were all originally stationed at Crewe. No. 2204, previous to being sent to Rugby, was at Edge Hill for a short time, and worked on the 11 a.m. up and 5.55 p.m. down from Euston; 1093, of the same batch, is now also at Rugby, the remainder, with the exception of No. 2395, being still stationed as shown in the March paragraph."

* * *

MR. MALCOLM M. NIVEN writes: "Mr. Gerald Guthrie mentions about the outside cylinder Caledonian 4–4–0 engines; until some years ago these engines ran Glasgow to Ardrossan trains, they were 126–7–8. There may have been some others, but they were very much like Mr. Ahrons illustration on page 191 March magazine, which he calls Ginx's babies; they had cut-out oval splashers both to trail and driving wheels, and had Gooch valve gear. The 2–4–2 tanks ran for a good while between Central and Hamilton, Busby and East Kilbride, also to Motherwell; they had old straight chimneys and domes with safety valves over fire-box casing; they were numbered somewhere about 150 or so. This was in the year 1890. There were also some 2–4–0 tanks much similar, but they ran on the Glasgow and Strahaven route. One ran for a long time on the Renfrew and District Railway; in 1902–3 it was 149. Another ran from Beattock to Moffat on the branch and was there in 1909. Nos. 473–479–380 had round cabs, Drummond funnels, and one up to a year ago ran the milk train Irvine to South Side, Glasgow. They became 1473–1479, but I never saw 380 in duplicate. One of these ran to Wemyss Bay about 22 years ago, usually with the 6.15 Central, Driver Robert Dixon, the veteran driver, stationed at Wemyss Bay, drove it. I do not mind what number it was, some are in existence yet."

* * *

ON Tuesday, March 13th, the Railway Club held its monthly meeting. Unfortunately, Mr. C. H. Palmer was unable to give his paper on "Single Line Railways," but Mr. B. M. Bazley stepped into the breach and at short notice read a paper on Mr. Gattie's scheme to provide London with a central Clearing House for metropolitan goods traffic. The lecture proved very interesting and left no doubt in the minds of those present that this project of the New Transport Company is a long way from practical politics: several members expressed a wish that some outside people who are only conversant with this scheme from one point of view could have been present, as it might have opened their eyes to the visionary character of the project and the rather violent means taken to place it in a favourable light before the railway and commercial powers. The next meeting of the Club will be held at 92, Victoria Street, S.W., on Tuesday, April 10th, at 7 p.m., when Mr. Palmer will give the paper held over from March.

* * *

WE are officially informed by the UndergrounD Railways of London that owing to unforeseen circumstances the opening of the Bakerloo extension, which had been announced for Monday, April 2nd, will be delayed for probably two weeks or so later.

* * *

WE regret to record the death in London from pneumonia of Hon. Lieut.-Col. G. A. Stanley, Traffic Manager, Uganda Railway, recently recommended by General Smuts for meritorious service on active service. The deceased officer received his railway training on the Great Western Railway.

* * *

PREVENTED by the state of his health from continuing to give to the duties of the office the same close application as heretofore, Mr. Frederic W. Pim has relinquished his position as Chairman of the Dublin and South Eastern Railway, having been twenty years at the head of the Board. He will retain a seat as an ordinary director.

* * *

EARLY in March a blizzard raged in Lochaber for three days, and big snowdrifts have formed in exposed localities. On Tuesday night, March 6th, the West Highland Railway was completely blocked, and the afternoon passenger train from Fort William to Glasgow, which was held up throughout the night on Rannoch Moor, was sent back on Wednesday. Two other trains were embedded in the snow, and though large squads of men have been put to work clearing the drifts a passage is no sooner cleared than it is blocked again.

* * *

NEW works on the Great Western Railway have recently been authorised as follows:—Penzance—reconstruction of viaduct; Plymouth (Sutton Harbour)—formation of new roadway in mileage yard; Acrefair—provision of additional siding; Dudley—provision of island platform in goods shed; Oxford—extension of goods office accommodation.

* * *

THROUGH the exigencies of war traffic working, several tank engines belonging to the South Eastern and Chatham Railway are now in regular use on the Great Western Railway. They are employed on local services, and are frequently to be seen in the Bristol district.

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PLATFORM DESTINATION INDICATORS.
Waterloo Station, London.

To the various styles of indicators provided by the London and South Western Railway for the guidance of passengers, two of new design have recently been added. One, known as the platform destination indicator, takes the place of the train destination boards exhibited above the platform gates at Waterloo station, London, on the old semaphore principle, which had to be changed by hand after each outgoing train. The new indicators which have been fixed above the gates leading to platforms 1, 2, 3, 4, 16, 17, 18, and 19 simplify this operation. They are hexagonal in shape, and on their faces are painted the various destinations of the electric trains departing from the respective platforms. The framework covers five of the sides, leaving visible only the one bearing the destination of the next departing train. By means of a short pole the indicator is easily turned to show the name required. Apart from greater ease in manipulation, the new system obviates the necessity of keeping a number of loose boards adjacent to the gates, and gives a much tidier appearance than hitherto. The accompanying illustration shows two of these indicators in position.

* * *

PROBABLY no enterprise in southern British Columbia showed more marked progress during 1916 than the Kettle Valley Railway. The railway forms the chief link of the Canadian Pacific's southern British Columbia short line system. It started operating in June, 1915, with daily service between Nelson and the coast, *vid* Penticton and Hope. Since the beginning of 1916 the number of Kettle Valley Railway employés and the total amount of the company's pay-roll have doubled. Now the railway has about 1,000 employés. The operation of the railway has increased the population of the town of Penticton by about 1,000 in a short period.

* * *

VERY successful was the meeting of the Model Railway Club on Thursday, March 8th, 1917, when an Exhibit Competition was held. Some excellent models were on view and the ballot resulted as follows:—*Class A for Locomotives*—1st Prize and Certificate, Mr. F. Turner, for a fine Great Northern Tank Locomotive; 2nd Certificate, Mr. Barnard, for an Atlantic Locomotive (*Free Lance*); 3rd Certificate, Mr. W. R. S. Smart, for a London, Brighton and South Coast Tank. *Class B for Rolling Stock*—1st Prize and Certificate, Mr. G. Curtis, for a fine set of trucks; 2nd Certificate, Mr. F. Turner, also a set of trucks. The next meeting will be held on Thursday, April 12th, when Mr. J. L. Hayward will read a paper on "Building an Electric Locomotive." Readers interested should communicate with the Hon. Sec., Mr. T. W. Pitt, 17, Northumberland Avenue, Wanstead Park, E.12.

* * *

DURING the year 1916 no fewer than 15,923,953 passengers were carried over the Glasgow Subway Railway, the Company's receipts being £61,007. Expenditure during the same twelve months amounted to £42,960, so that the net receipts were £18,147. To this sum must be added £5,670 received for rents from houses, lands, etc., which with £5 for transfer fees made the total net income of the company £23,822. The record year for passengers and receipts was 1908, when 17,206,790 passengers were carried and the revenue produced amounted to £68,916.

* * *

UNDER the able control of its Engineer and Manager, Mr. E. J. Neachell, the Liverpool Overhead Railway continues to prosper. During 1916 the number of passengers carried reached the grand total of 16,674,643 as compared with 15,082,502 in the previous twelve months. The receipts in respect of the railway and tramway amounted to £105,526 and the expenditure £73,394, leaving a balance of £32,132, to which sum must be added £1,335 received for rents from houses, lands, etc., and for transfer fees, so that the total net income was £33,467. Ordinary shares received a dividend of 3¼ per cent. for the year.

* * *

RECENTLY opened for traffic, the East Kent Light Railway will, as far as can at present be judged, fully justify its construction. The line commences with a junction at Shepherd's Well with the main line of the London, Chatham and Dover Railway, and terminates at a point near Sandwich on the South Eastern Railway, with several branches, and is intended to develop the East Kent coalfield. A promising start has been made in the colliery business on the new railway, and one colliery alone is producing upwards of

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2,000 tons per week. The stations are Ashtown, Eastry, Eythorne, Knowlton, Sandwich Road, Shepherd's Well, Staple, Tilmanstone Village, Wingham Colliery Station, Woodnesborough and Hammell Colliery Station, Woodnesborough Road. The new line is worked by the South Eastern and Chatham Railway.

* * *

At a recent meeting of the General Managers' Conference, at the Railway Clearing House, it was resolved that during the period of the war the ordinary meetings of this Conference be held half-yearly instead of quarterly; similar arrangements to apply to the Goods Managers' and Superintendents' Conferences.

* * *

Mr. David Cooper, General Manager of the Glasgow and South Western Railway Company, presided at the annual distribution of certificates and prizes to members of the St. Enoch station ambulance section of the St. Andrew's Ambulance Association. The Chairman, after complimenting the section on the success of their efforts, said that the Glasgow and South Western Railway employees were the pioneers of railway ambulance work. The first class was started in Hurlford, and 22 years ago the directors presented a cup for annual competition. There were now about 2,000 ambulance students in connection with their railway, and they had an ambulance brigade consisting of 18 sections and a membership of over 500. The certificates and prizes were afterwards handed over by Mrs. Cooper, and Dr. Campbell Maclean, the lecturer to the section, was presented with a tantalus by Mr. R. Gilmour, stationmaster at St. Enoch station.

* * *

"Great Portland Street" is the new name given to the old "Portland Road" station on the Metropolitan Railway. The reasons for the change are twofold and logical; there is no longer a thoroughfare named Portland Road near the station, and Great Portland Street is now a household word, and the centre of the high class motor car trade. Most Railway Magazine readers will remember that Gower Street, the next station going citywards, was a few years ago renamed Euston Square.

* * *

Common user of railway wagon sheets has now been extended in a manner somewhat similar to that recently made as regards wagons, sheets belonging to the railway companies in Great Britain being available, with a few exceptions, as common stock. Reciprocal arrangements have been made under which repairs to sheets will be carried out by the company upon whose system the sheets are at the time the repairs are found to be necessary.

* * *

Signal success is attending the London Underground Railways and London General Omnibus Company group operating department efficiency meetings at the tenth series at the London General Omnibus Company Training School, Milman's Street, Chelsea, Mr. H. E. Blain in the chair, the paper for the evening was entitled "Consideration of some Staff Problems." It was given by Mr. F. H. Mercer, Chief Clerk to the Superintendent of the Line. In this paper the changes of the last 25 years in railway operation were traced, special attention being devoted to the improvements in staff conditions. The various methods of dealing with disputes, such as the Conciliation Board scheme, were described, and methods of discipline and merit were discussed. Some important particulars were given as to special organisation necessary in connection with such abnormal periods as Coronation week, etc., and special problems awaiting solution after the War were entered into by a number of the subsequent speakers.

* * *

Mr. Thomas Pitt, recently appointed stationmaster at Burton-on-Trent, Midland Railway, from St. Albans, where he had been for 11 years, has been the recipient of a second testimonial at the latter city, this time on behalf of the traders, season ticket holders, and other residents. The presentation took place at the Town Hall, when the chair was occupied by Councillor F. W. Dunham (Chairman of the Chamber of Commerce), who was supported by a number of other representative citizens. A warm tribute was paid to the admirable manner in which Mr. Pitt had met the requirements of the local public (his courteous dealing, his sense of fairness, and his genial disposition), while at the same time staunchly safeguarding the interests of his Company, and though regret was expressed at his departure from amongst them, hearty congratulations were accorded him upon his promotion. The testimonial took the form of a beautifully illuminated address, accompanied by a cheque for 40 guineas.

* * *

At the annual general meeting of the Isle of Wight Central Railway, Mr. Harry Willmott, the Chairman, said that the report and financial accounts were in the modified form approved by the Board of Trade. A further variation had been made in the agreement with the Government under which compensation was payable. Interest was now allowed upon capital expenditure where the works, etc., had been brought into use during or since the basis year 1913, and any amount due to them up to the present would be brought into the 1917 accounts. £1,000 debenture stock "B" had been issued during the year. They had overspent on capital only £1,690, compared with £1,904 at the end of 1915, and the receipts, including estimated Government compensation, were up £1,700. During the year they had carried about 100,000 more passengers than in 1915. He thought they were justified in assuming from this, and bearing in mind the abnormal conditions, and that Bank Holidays were cancelled in the island, that their policy of reducing the fares to mainland basis of 1d. per mile would have given them a larger increase in passenger traffic without the war, and so the second preference stockholders would have rejoiced. Goods traffic was down, caused by the war

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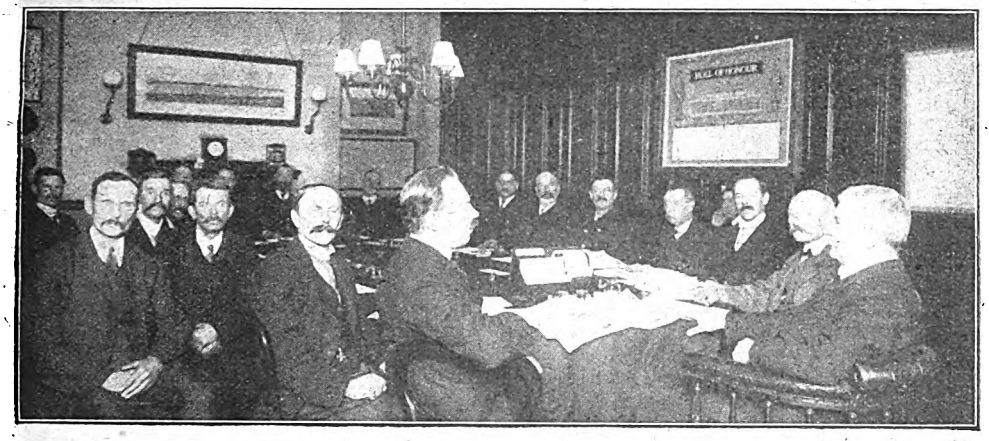

This Committee is doing useful work in encouraging the cultivation of hitherto unproductive land.
LONDON AND SOUTH WESTERN RAILWAY "POTATO GROWING" COMMITTEE.

interruption of shipping at Medina Wharf and stagnation of the building trade. The expenses were up £1,700, mainly attributable to war bonus, the increased price of materials, and coal. The interest on debenture stock and bank interest had been £150 more than in 1915, and the balance available for dividend was £200 less. They, therefore, proposed to pay £3 10s. per cent. for the year on the first preference stock against £3 15s. per cent. in 1915, carrying forward only a very slightly smaller balance of £777, against £806 in 1915.

* * *

PRESIDING at the annual meeting of the Stratford-on-Avon and Midland Junction Railway, Mr. Harry Willmott said that the capital expenditure during the year had been £495 in respect of additional sidings to meet new iron ore traffic. Expenditure during the year had again been heavy owing to the necessary and safe upkeep of the railway and the increased war bonus and price of materials. The net receipts showed a slight reduction, made up of miscellaneous receipts, so that the total net income was about the same as last year. The railway being a connecting link between the trunk lines of the London and North Western, Great Western, Midland, and Great Central systems, they had carried a large tonnage of Government traffic, hay, and timber from most stations, munitions and military stores on through trains, and proved useful for through troop trains. A large tonnage of iron ore had been carried since the war began, obtained from mines connected with the railway, and there was scope for further extensive development. There were 30,000,000 tons within easy distance of their line. Continuing, Mr. Willmott remarked: I cannot help remembering that when I first looked into the affairs of this railway I found a clause in an old Act of some 50 years ago stating that this railway was brought into use especially for carrying iron ore to South Wales. Well, the ore is there, and there are German prisoners in England, but the ships are down below. We have the railway to carry the ore. We have had negotiations with various departments, and we have said: "Let us have, say, 5,000 German prisoners to work it, there are millions of tons to be had." I have great faith in the present Prime Minister, and I am sure if he only knew the position in our district he would act at once. It has been, however, so difficult to approach him owing to his being so pre-occupied with important matters of State. What we want are enterprising men who will deal with the matter of the ore in our district.

* * *

SINCE the outbreak of war the conveyance of home-grown timber over the Cambrian Railway's system has increased enormously, and the company has had every assistance from other railways, particularly the London and North Western, Great Western, and Great Central, in the matter of timber trucks. In fact, but for this assistance they could not possibly have handled the traffic. There is one serious aspect of this matter, and that is that the Cambrian district is rapidly being denuded of forests, and it is to be hoped that the Government will, on the conclusion of the war, take in hand energetically the matter of replanting.

* * *

AS RAILWAY MAGAZINE readers are aware, beginning with the new year, a general pooling of open goods wagons was put into operation by the Railway Executive Committee, and it is reported that so far as the Cambrian Railway's experience goes, the results have been most satisfactory. The Cambrian has been put into the London and North Western Railway's section of the pool, and has received every assistance from that Company. Not only have the Cambrian had sufficient wagons for traffic, but there has been considerable relief in empty haulage, and the Chairman at the recent annual meeting stated he had very little doubt but that whatever may happen to railways after the conclusion of the

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THE RAILWAY MAGAZINE.

NORTH EASTERN RAILWAY TRAIN ON FURNESS RAILWAY NEAR ARNSIDE.

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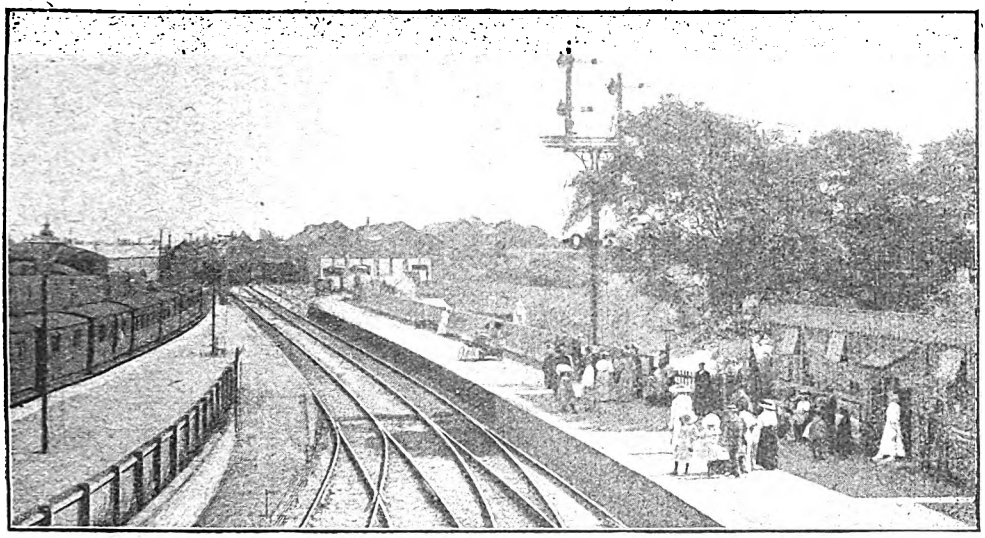

HIGHBRIDGE STATION WITH LOCOMOTIVE WORKS IN BACKGROUND.

The Somerset and Dorset Joint Railway.

By H. L. HOPWOOD.

Photographs by A. W. Bartlett.

LEASED and operated by the Midland and London and South Western Railways as a joint undertaking, the Somerset and Dorset Joint Railway forms an important North to South connection between the parent Companies' systems, the main line reaching from Bath (Midland) to Broadstone, near Bournemouth (London and South Western). The branch line which extends from Evercreech Junction to Burnham, on the Bristol Channel, was originally a portion of the main line of the old Somerset Central Railway. From this branch there are also two minor offshoots, from Glastonbury to Wells, and from Edington Junction to Bridgwater.

A detailed history of the Somerset and Dorset Joint Railway down to the year 1875 appeared in the RAILWAY MAGAZINE, January and February, 1905, but it may be as well briefly to repeat some of the more important facts relating to the growth of the system since its inception, and to bring the previous account up-to-date.

The Somerset and Dorset Railway was formed by an amalgamation of two systems, the Somerset Central Railway and the Dorset Central Railway. The Somerset Central Railway was the older of the two, and its various Acts, the first of which was dated June 17th, 1852, provided for the construction of a railway on the broad (7 ft.) gauge from Burnham, on the Bristol Channel, to Bruton, near Cole, where a junction was to be effected with the Dorset Central Railway. A branch from Glastonbury to Wells was also included. The first portion opened was that from Highbridge Harbour to Glastonbury on August 28th, 1854. A Northern extension from Highbridge to Burnham, with a pier at the latter place, was opened on May 3rd, 1858, the branch from Glastonbury to Wells on March 15th, 1859, and a further extension of the main line from Glastonbury to join the Dorset Central Railway near Cole in 1861. The railway was worked by the Bristol and Exeter Railway under agreement for a period of seven years from August 28th, 1854.

The Dorset Central Railway, a standard gauge line, extended from Wimborne, on the Southampton and Dorchester branch of the London and South Western Railway, to a junction with the Somerset Central Railway near Cole. It was originally incorporated on July 29th, 1856, and was opened from

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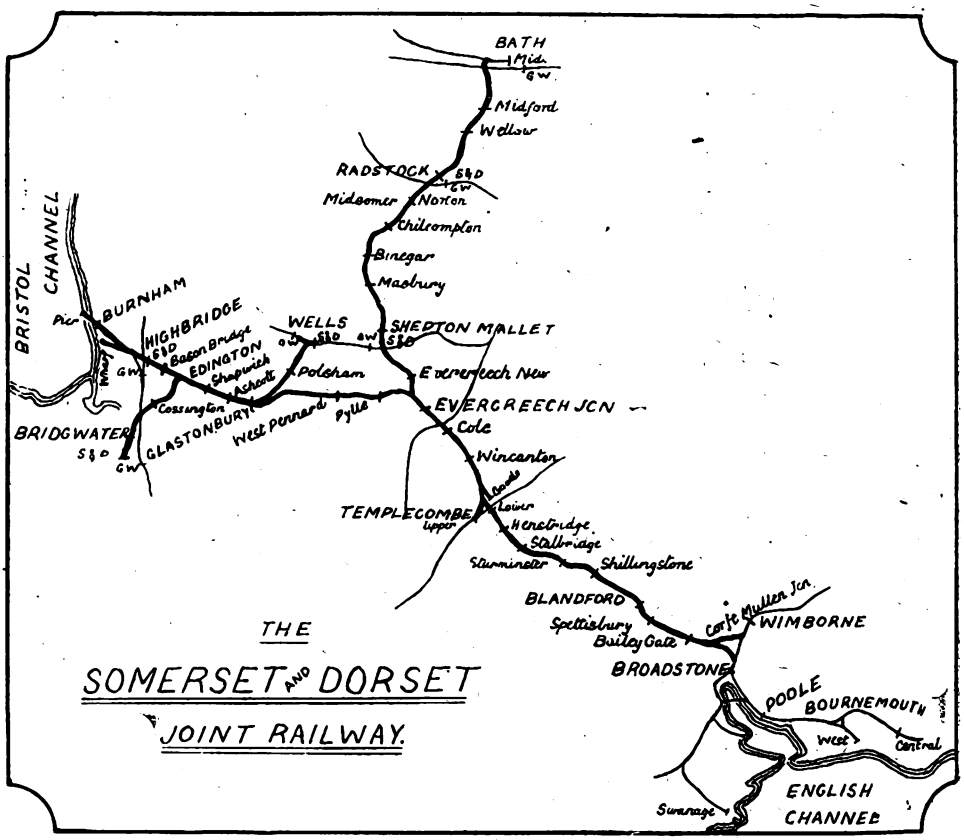
Wimborne to Blandford on November 1st, 1860, and from Templecombe to the aforesaid junction with the Somerset Central Railway a year later. Its Southern portion (Wimborne to Blandford) was at first worked by the London and South Western Railway.

It will be noted that when first opened the Somerset Central and the Dorset Central Railways were of different gauges, but apparently the former Company adopted the 7 ft. gauge rather as a matter of necessity than of choice, as the neighbouring railways

at Highbridge and some standard gauge engines ordered from Messrs. George England and Company, of Hatcham Ironworks.

On the expiration of the working agreement with the Bristol and Exeter Railway on August 28th, 1861, the Somerset Central Railway then commenced to work the line with their own engines, also operating the portion of the Dorset Central Railway between Cole and Templecombe when it was opened in November, 1861. From that time the broad gauge rails fell into disuse.



—the Bristol and Exeter and allied lines—were all constructed on the broad gauge. From an early date an amalgamation between the Somerset Central and Dorset Central Railways was seen to be advantageous to the two Companies, and in anticipation of this event the Somerset Central Railway obtained powers in 1859 to "mix" the gauge of their line and to provide their own rolling stock to work it, together with that of the Dorset Central Railway. For this purpose workshops were provided

On September 1st, 1862, the two Companies were amalgamated under the title of the Somerset and Dorset Railway, and on August 21st, 1863, the final link connecting the two lines (*i.e.*, from Blandford to Templecombe) was completed. The Somerset and Dorset Railway had now gained its objective—a line giving through communication between the English Channel and the Bristol Channel, the system at that date being some 68 miles in extent. The railway was, however, quite a local one, and it became

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apparent that if it was to prosper it must be extended further afield. Therefore in 1869 powers were sought and obtained to construct a new line from Evercreech to a junction with the Midland Railway at Bath. This section was opened on July 20th, 1874, and provided a new route between the Northern and Southern counties, besides tapping *en route* the coalfields in the Radstock district, and several important traffic centres.

The Somerset and Dorset Railway had not passed unscathed through the financial crisis of 1866. It took three years to recover from the effects of this, but the drag of the additional capital raised in connection with the Bath extension, and other matters, once more plunged the Company into financial difficulties. The Bristol and Exeter and Great Western Railways were approached with a view to those Companies leasing the Somerset and Dorset Railway, but the terms offered were not considered sufficiently favourable to Somerset and Dorset interests, and the matter was dropped. The Midland and London and South Western Railways, who saw great possibilities in the future of the line, at once negotiated for it and were successful in obtaining a joint lease for a period of 999 years. This transaction was undoubtedly a good measure seeing that the Somerset and Dorset line formed a direct connection between the Midland and London and South Western Railways without break of gauge. The arrangement took effect on November 1st, 1875, and from that date the system has been known as the Somerset and Dorset Joint Railway. It was then the second largest joint railway in the country, but at the present day it occupies only fourth place in this respect.

When an independent Company, the Somerset and Dorset Railway had obtained running powers over the London and South Western Railway from Wimborne to Poole, at that time the nearest station the Somerset and Dorset trains could reach in the direction of Bournemouth, as the London and South Western line between Poole and Bournemouth West was not then in existence. When this latter line was completed in June, 1874, Somerset and Dorset trains were diverted over it and into Bournemouth West station, but they still had to reverse at Wimborne as they had done from the first. The opening on April 26th, 1886, of a direct line, 2¾ miles long, between Corfe Mullen Junction and Broadstone Junction rendered unnecessary this reversal, and since then the more important trains between Bath and Bournemouth have travelled by this route. The most recently constructed section of the Somerset and Dorset Joint Railway is the branch line from Edington Junction to Bridgwater, the opening of which took place on July 21st, 1890.

The following table gives the distances of the main line and branches over which passenger trains work :—

Main Line.

	Miles.	Chains.
Bath Junction to Broadstone Junction	63	6
Connection to London and South Western Railway at Templecombe	—	34
Branches.		
Evercreech Junction to Burnham	24	21
Glastonbury to Wells ..	5	33
Edington to Bridgwater ..	7	15
Corfe Mullen Junction to Wimborne Junction	3	2
Total	103	31

Including all branches, such as those to goods yards, collieries, etc., the total mileage of the system to-day is 105 miles 54 chains. The actual distance traversed by Somerset and Dorset trains between the Midland station at Bath and the London and South Western station at Bournemouth West is 71 miles 37 chains.

In addition to the physical junctions with the parent Companies' systems at Bath, Templecombe, Wimborne and Broadstone, the Somerset and Dorset Joint Railway also effects junctions with the Great Western Railway at Highbridge and Wells. At Highbridge the two railways cross each other on the level, and at Wells the Somerset and Dorset line forms the only connection between the Cheddar Valley and East Somerset sections of the Great Western Railway, and the latter Company's trains between Yatton and Witham run over this short length (9 chains) of Somerset and Dorset line. These Great Western trains do not stop at the Somerset and Dorset station, as their own station is only 7 chains distant. A reference to the accompanying map will make the matter clear.

Originally a single line, much of the main line of the Somerset and Dorset Joint Railway has since been doubled. A double line now exists between Midford and Templecombe (Upper station), and also between

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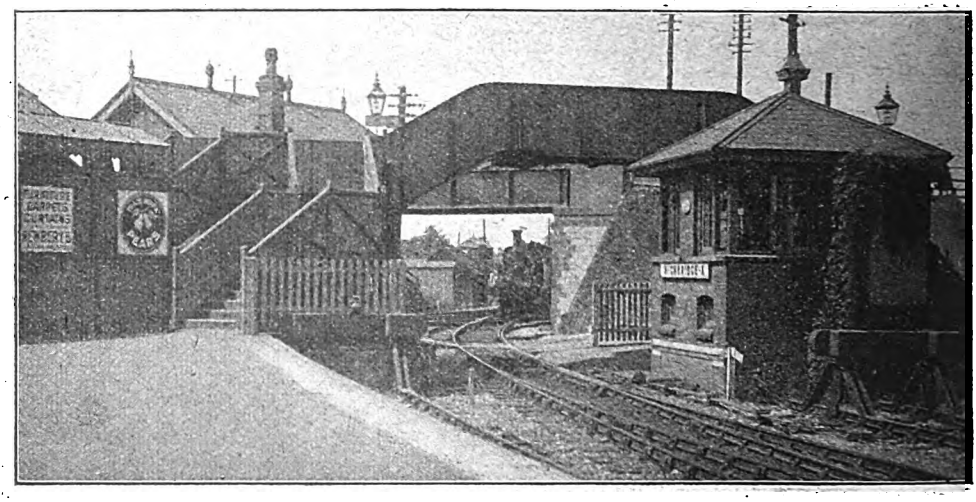
Blandford and Corfe Mullen Junction, a total distance of 40½ miles. Between Bath and Midford there are two long tunnels and as the duplication of these would be a very costly matter, at present this portion of the line remains single. On the single line sections between Templecombe No. 2 Junction and Blandford, all stations except Henstridge are provided with passing loops, and there is also an intermediate crossing place at Stourpain, between Shillingstone and Blandford. All branch lines are single, but frequent crossing places are provided.

From the engineering standpoint, the Bath to Evercreech section is the most interesting. Between those stations the line crosses the Mendip Hills and abounds in heavy gradients, cuttings, embankments, tunnels and viaducts. In these circumstances it is not surprising to learn that the cost of construction was very great. As a matter of fact, this length of 26 miles cost some £400,000 to build, and, as already indicated, landed the original Company in serious financial difficulties.

Half-a-mile after leaving the Midland station at Bath, Somerset and Dorset territory is entered upon, and the line commences to rise at 1 in 80 and 1 in 50 through Devonshire Tunnel. After clearing this, Combe Down Tunnel, 1,829 yards in length, is entered, and the gradient alters, falling at 1 in 100 for about half-a-mile. For the next 7 miles to Radstock the line rises and falls alternately in short but severe lengths. On leaving Radstock, however, there is some very heavy pulling for the engines, as the line ascends at 1 in 53, 50, 60, 67, 70, etc., for 8 miles in order to cross the Eastern side of the Mendip Hills. Soon after the 18th mile post (between Binegar and Masbury) is passed, the highest point of the railway is reached, 811 ft. above sea level; thence it descends, mostly at 1 in 50, to near Shepton Mallet, passing *en route* through the Winsor Hill single line tunnels (600 yds.) and over several large viaducts. The longest of these, known as Kilver Street viaduct, and consisting of 25 arches, is situated immediately North of Shepton Mallet station. From this station the line continues its descent, chiefly at 1 in 50, to Evercreech Junction. From Evercreech to Bournemouth the line is easier, having a slightly falling tendency, but gradients as steep as 1 in 100 are the rule rather than the exception on this section.



LEVEL CROSSING AT HIGHBRIDGE.
Train from Burnham approaching.

Save for the Pylle bank of 1 in 100 met with soon after Evercreech, the Burnham branch is practically level. At Pylle the line falls for about 3½ miles (broken by a short piece of level about half way) towards West Pennard. The Bridgwater branch has several short stretches at 1 in 72, but on the Wells branch there is nothing worth noting except a short rise at 1 in 105 approaching the terminus. At Burnham the line is continued past the station on to a stone pier, and this is reached by means of a falling gradient of 1 in 23. At the further end of the pier the rails now disappear into the sea. Formerly a service of steamers

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operated between Burnham and Cardiff, but the boats were withdrawn in 1871 and for many years the pier line has been in a derelict state.

The locomotive works at Highbridge have already received brief notice. The shops have been enlarged and their equipment brought up-to-date from time to time, so that at the present day they are in a position to produce first class work.

Most of the original Somerset Central Railway engines were built by Messrs. George England and Company, of Hatcham Ironworks, a London firm of locomotive builders that has long ceased to exist. With few exceptions, these early engines disappeared many years ago. Two built by the Vulcan Foundry in 1866, Nos. 15a and 16a, were withdrawn only in 1914. Of these, No. 16a is illustrated on page 313. They had cylinders 17 in. by 22 in. and four-coupled wheels 5 ft. in diameter.

The present locomotive stock totals 86 engines, divided into various types as under :—

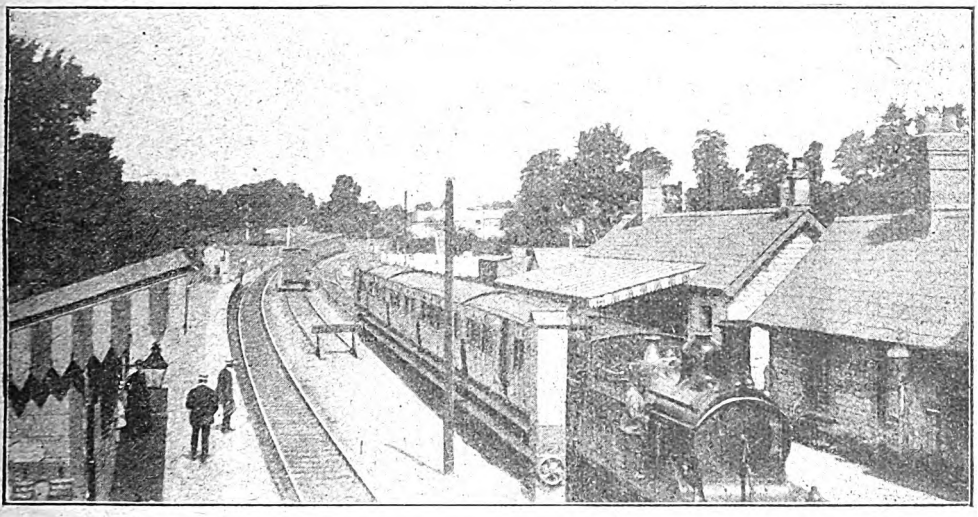
Tender Engines.

	No. in class.
0-6-0	41
4-4-0	13
2-8-0	6
	—
	60
	—

Tank Engines.

0-4-4	13
0-6-0	8
2-4-0 .. .	2
0-4-0	2
0-4-2	1
	—
	26
	—

Of the above engines, two only are survivors of the old Somerset Central stock. Originally built as tender engines in 1861, they have been rebuilt as 2-4-0 side tanks with 16 in. by 18 in. cylinders and 5 ft. wheels, and are now numbered 27a and 28a. They are generally employed as shunting engines at Highbridge.



EVERCREECH JUNCTION LOOKING NORTH.

A further 15 engines are those built during 1874 and 1875 when the Somerset and Dorset Railway was an independent Company. They comprise eight 0-6-0 saddle tanks (Nos. 1 to 7 and 9) with 4 ft. wheels and seven 0-6-0 tender engines (Nos. 8 and 19 to 24) with 4 ft. 6 in. wheels, both classes having 17 in. by 24 in. cylinders. Most of the saddle tanks are stationed at Radstock for banking goods and mineral trains in either direction to the summit near Masbury.

The remaining 69 engines have been built since the Midland and London and South Western Railways obtained joint control of the line, and these engines very closely follow Midland locomotive practice. The

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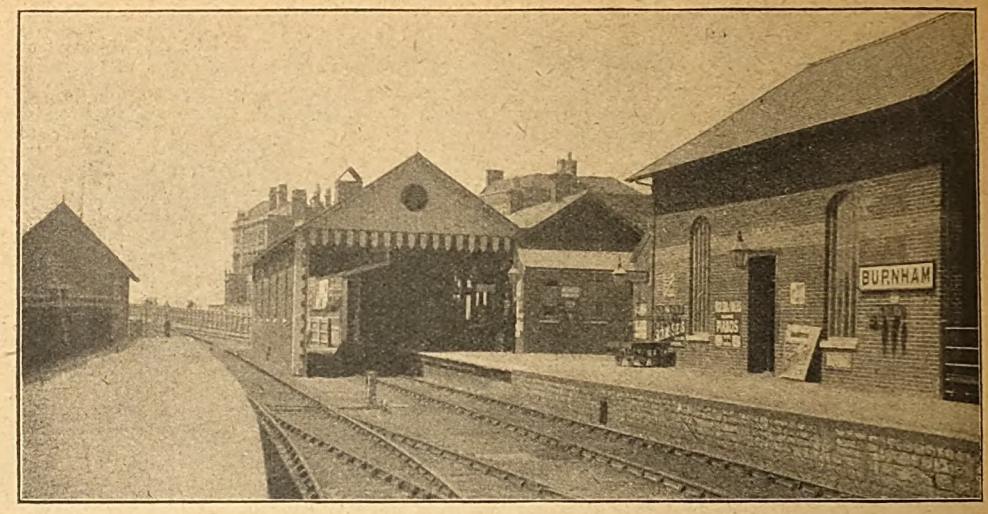
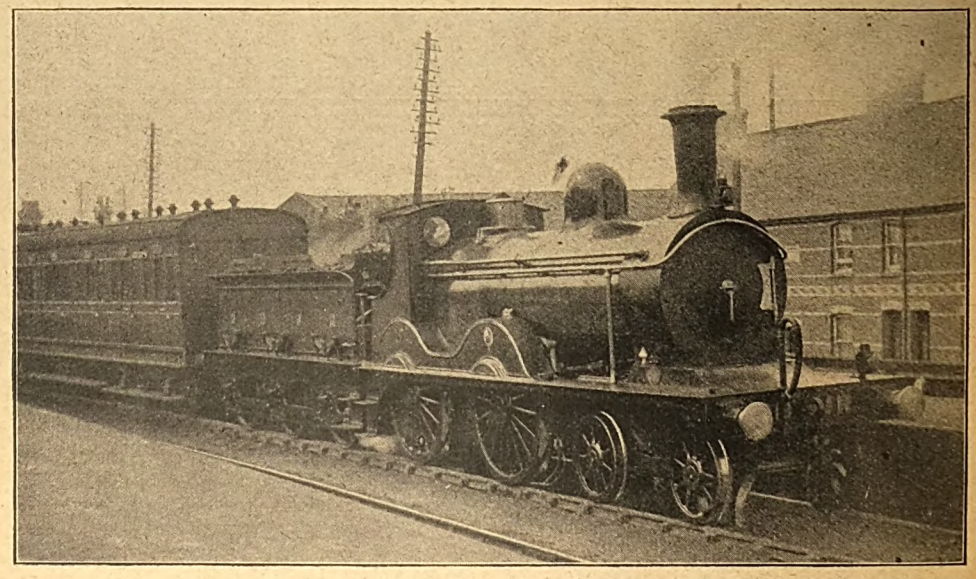


BURNHAM STATION.

thirteen 0–4–4 side tanks were built by private firms between 1877 and 1885. They are numbered 10 to 13, 14a, 29 to 32 which have cylinders 18 in. by 24 in. and 52 to 55, with cylinders 17 in. by 24 in., all having wheels 5 ft. 3 in. in diameter.

There are also twenty-four 0–6–0 tender goods engines of Midland design, built between 1878 and 1890. They are numbered 25, 26, 28, 35 to 42, 44, 46 to 51 and 56 to 61. In 1896 a larger series appeared, Nos. 62 to 66; followed by Nos. 72 to 76 in 1903. The earlier engines of this class have 4 ft. 6 in. wheels and 17 in. by 24 in. cylinders, whilst the later ones (from No. 62) have 5 ft. 2½ in. wheels and 18 in. by 26 in. cylinders.

The 4–4–0 express engines, of which there are 13, all built at Derby, were introduced in 1891. They are numbered 14 to 18, 45, 67 to 71, 77 and 78. The first eight of this class have 5 ft. 9 in. coupled wheels



SOMERSET AND DORSET JOINT RAILWAY.
4–4–0 Engine, No. 17, as at first re-boilered.

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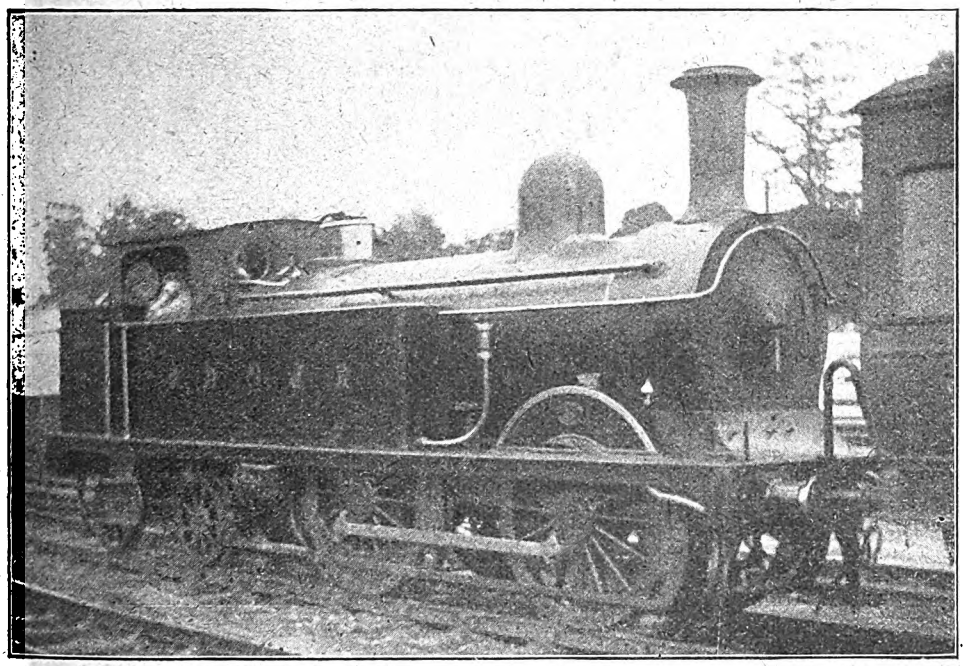
and 18 in. by 24 in. cylinders; but commencing with No. 69 the dimensions are larger throughout, wheels being 6 ft. in diameter and cylinders 18 in. by 26 in.

Nearly all the engines have now been reboilered in accordance with the latest Midland practice. In 1914, two of the express engines, No. 70 and 71, were rebuilt with superheated boilers, and in view of their comparatively large size, detailed dimensions are given. Cylinders are now 20½ in. by 26 in. and the size of the coupled wheels has been increased from 6 ft. to 7 ft. The boiler, which works at a pressure of 160 lbs., gives a total heating surface of 1,510 sq. ft., of which 338 sq. ft. is provided by the superheater. Grate area is 21·1 sq. ft. In working order the engine and tender together weigh 89½ tons.

The latest engines consist of a class of six large 2–8–0 tender engines, Nos. 80 to 85, built at Derby for working coal traffic from Radstock to Bath and Templecombe. They have 21 in. by 28 in. cylinders, and 4 ft. 7½ in. wheels, the heating surface being 1,681 sq. ft., and the working pressure 190 lbs. These engines have been introduced to work considerably heavier loads and incidentally to reduce the number of trains running.

For shunting in the colliery yards at Radstock there are three small four-coupled saddle tank engines, Nos. 25a, 26a, and 45a. No. 25a has the 0–4–2 wheel arrangement, but the other two are 0–4–0 engines. Nos. 27, 33, 34, 43 and 79 are blank numbers.

Blue is standard colour for both engines and carriages, the lining being very effectively carried out in yellow and red lines. Engines Nos. 80 to 85, however, differ in being painted black, unrelieved by any lining. Carriages, most of which have been constructed at Highbridge Works, are of the Somerset and Dorset Joint Railway's own design and not copies of either Midland or London and South Western Railway stock.



SOMERSET AND DORSET JOINT RAILWAY.
0–4–4 Tank Engine, No. 12, with new boiler.

Reference must be made to the curious method of train working adopted at Templecombe, where the Somerset and Dorset Joint line passes at right angles under the London and South Western main line. At this point is situated a single platform station known as Templecombe Lower, but it is rarely, if ever, used at the present day. A little north of the Lower station is Templecombe No. 2 Junction, whence there is a spur line on a steep ascending gradient to the London and South Western, or Upper,

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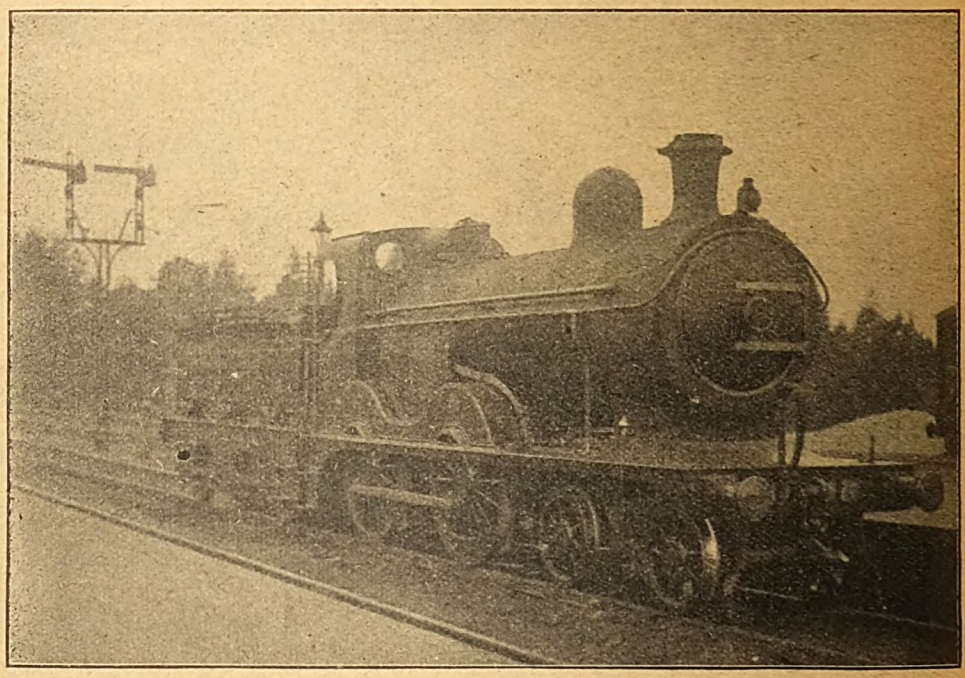
station. Down trains from Bath to Bournemouth calling at Templecombe proceed direct to that station, where a pilot engine is attached to the rear. On leaving Templecombe with two engines, the pilot engine draws the train back to No. 2 Junction, and is detached there, the train going forward to Bournemouth with its original engine. Occasionally such trains, when heavy, are piloted between No. 2 Junction and the station in both directions.

Up trains proceeding from Bournemouth to Bath stop at Templecombe No. 2 Junction to attach the pilot engine on the rear, and this engine pulls the train to the Upper



SOMERSET AND DORSET JOINT RAILWAY.
4–4–0 Engine, No. 67, re-built with latest class of boiler.

station, the train engine pushing. On leaving the station, the pilot engine remains behind, and the train proceeds to its destination without stopping a second time at the junction, as is necessarily the case with down trains.

In normal times a very creditable service of express and semi-fast trains is maintained between Bath and Bournemouth all the year round, and through Midland coaches are run from Newcastle, York, Bradford, Leeds, Sheffield, etc., to Bournemouth, and *vice versâ*, on the principal trains. The best down trains are the 2.13 p.m. (summer only) and 4.5 p.m. *ex*-Bath, which, avoiding Templecombe, reach Bournemouth (71 miles 37 chains) in 1 hour 54 min. and 2 hours 5 min. respectively. The 2.13 p.m. makes its first stop at Poole (at which station there is a compulsory stop for all trains—Somerset and Dorset as well as London and South Western), the speed between Bath and Poole averaging 41·36 m.p.h. The compulsory stop at Poole renders impracticable non-stop runs between Bath and Bournemouth, but such runs over the Somerset and Dorset system proper, *i.e.*, from Bath Junction to Broadstone Junction, are possible, and are performed every day during the summer season.

The 4.5 p.m. *ex*-Bath stops at Shepton Mallet, Evercreech and Poole, and is allowed 5 min. recovery time *en route*, so that probably its actual performance is better than that indicated by the time-table. Allowing for the extra stops, the running is little, if any, inferior to that of the 2.13 p.m. *ex*-Bath.

Expresses for the North leave Bournemouth at 8.37, 9.40 and 10.40 a.m., but of these only the 9.40 a.m. runs throughout the year, the others being summer trains only. The 8.37 a.m. is the quickest train, reaching Bath in 1 hour 50 min. with stops at Poole and Evercreech. In fact, this train,

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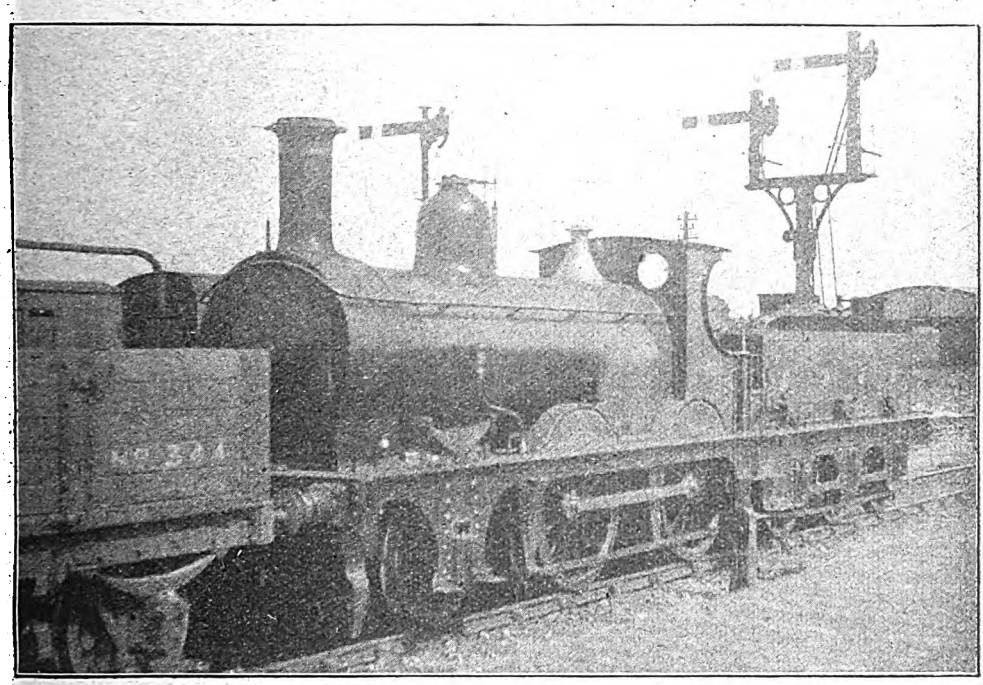
even with the two stops mentioned, is quicker by 4 min. than the best down train (2.13 p.m. *ex*-Bath) which has only one intermediate stop.

With five intermediate stops the 9.40 a.m. *ex*-Bournemouth occupies 2 hours 10 min. on the journey to Bath. Between Blandford and Evercreech it is sharply timed, the start-to-stop run of 26 miles 31 chains being made at the rate of 46·56 m.p.h. Following the 9.40 is the 10.40 a.m. *ex*-Bournemouth, which, with only one intermediate stop at Poole, reaches Bath in 114 min., the Poole to Bath run being made in 104 min., or at the rate of 38·72 m.p.h. The above mentioned are the principal trains between Bath "set" trains are extended beyond Bath, and start or terminate their journeys at either Mangotsfield, Bristol (St. Phillips) or Clifton Down.

Heavy gradients and single line sections prevent high average speeds being made. More than one third of the main line is still single track, and where the double sections occur, there for the most part are also situated the steepest gradients. The fastest bookings are in evidence south of Evercreech Junction, where 18 miles of single line track are encountered. On these sections trains exchange tablets at speed, this being rendered possible by the adoption of Whitaker's Automatic Train Tablet Ex-



SOMERSET AND DORSET JOINT RAILWAY.
Old Somerset Central 2–4–0 Engine, No. 16a, built 1866, broken up 1914.

and Bournemouth, and they are supplemented by a number of semi-fast trains which all call at Templecombe and occupy from 2½ to 3 hours on the through journey. A few of the main line stopping trains run *viâ* Wimborne (reversing at that station) and there is also one train each way in the morning between Wimborne and Bailey Gate; but in the majority of cases, Wimborne passengers travel by London and South Western trains to Broadstone, and there change on to the Somerset and Dorset Joint Line. Some of the Somerset and Dorset changing Apparatus, the invention of a former locomotive superintendent of the railway. All engines are fitted with this apparatus, and its use does not necessitate trains reducing speed to 15 or 20 m.p.h. at staff stations, as is usually the case where the staff or tablet is exchanged by hand.

The following are some examples of best train speeds between certain intermediate stations. Both the 2.13 and 4.5 p.m. *ex*-Bath average 31·04 m.p.h. from Bath to passing Masbury, this section including the steep pull up to the summit, several miles being at

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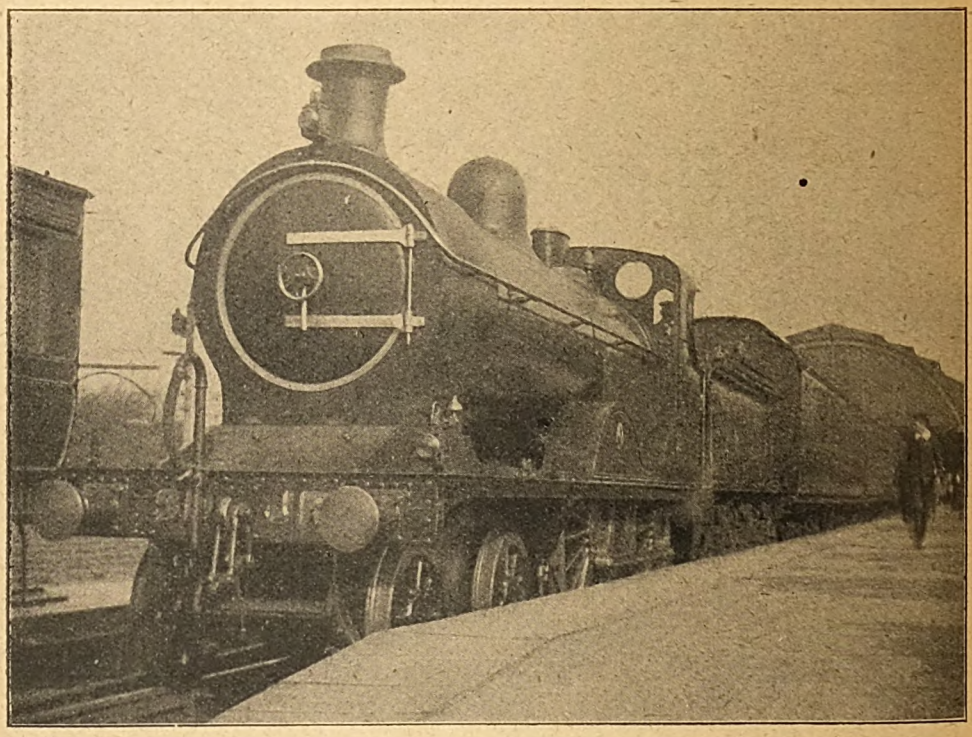
1 in 50–80. From passing Masbury to passing Blandford (34 miles 14 chains, of which 16 miles are single line), the 2.13 p.m. *ex*-Bath averages 46·6 m.p.h.; whilst the 4.5 p.m. runs without stop between Evercreech and Poole (40 miles 57 chains) at a speed of 46·08 m.p.h. In the reverse direction the 8.37 a.m. from Bournemouth runs between the same stations at 46·97 m.p.h., this being the fastest run between any pair of stations on the system. This performance is very nearly equalled by that of the

A few words need to be added in praise of this well managed railway. In several journeys recently undertaken on different parts of the system we recorded excellent time-keeping in all but two instances, and in these cases the late arrivals amounted only to 10 and 17 min. respectively. The stations and permanent way are very well maintained, the former being kept in good repair and well painted, whilst the permanent way (formed of 83 lb. rails) is well ballasted and has a neat and even appear-



SOMERSET AND DORSET JOINT RAILWAY.
Train in Bath station, hauled by latest class of 4–4–0 engine, No. 77.

9.40 a.m. *ex*-Bournemouth, which averages 46·56 m.p.h. from starting at Blandford to stopping at Evercreech, but in this case the distance is only 26 miles 31 chains. It is, however, a meritorious start-to-stop run in view of the comparatively short section, which includes the 16 miles stretch of single line already referred to. The 10·40 a.m. *ex*-Bournemouth averages only 45·23 m.p.h. in *passing* the same stations, the explanation of the slower booking being that the train would clash with others were it timed faster.

ance. These are small points in themselves, perhaps, but they go a long way towards creating a favourable impression of the railway in the eyes of the observant passenger. Many of the signal posts are formed of old rails, a curious but economical practice, and one not frequently adopted in this country. Finally, the smart and distinctive looking blue livery adopted for the engines and carriages is an excellent advertisement for the progressive Somerset and Dorset Joint Railway.

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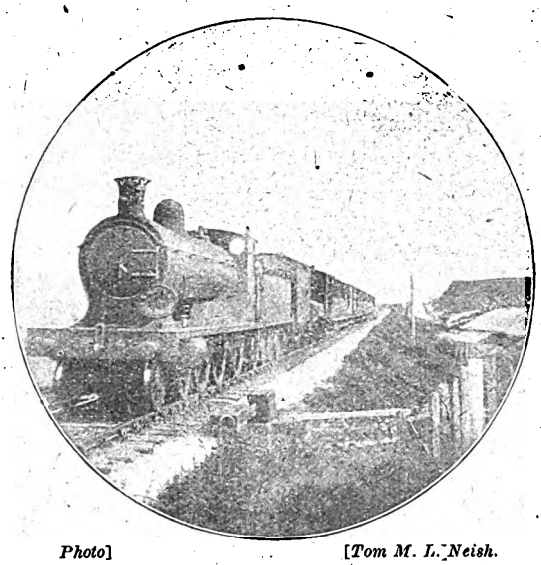
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Tom M. L. Neish.*

HIGHLAND RAILWAY.

Train from Inverness to Perth ascending Drumochter Bank near Inchlea.
4–6–0 locomotive, No. 142, *Dunrobin Castle* carrying "Engine Following" board.

A COMPARATIVE lack of interest in much of main line locomotive work affords me a long-awaited opportunity of dealing with runs in many directions which perhaps are more in the nature of "by-ways" than the famous and frequented trunk lines that figure the most often in these columns. Not that I would presume really to call these routes by-ways in any other sense than that of comparison—many of them, indeed, such as the North British "Waverley" route, dealt with at length in the last issue, or the sections of line covered in the present article, are very important links in through or cross-country communication, although to many readers probably somewhat "off the beaten track." At the same time if these articles are to present a comprehensive view of British express locomotive work, it stands to reason that every portion of line over which such work is performed should claim its due share of attention.

With these considerations in mind, I am dealing this month with two series of runs over sections of the Great Western line not often referred to—in one case between Paddington, Oxford and Worcester, and in the other between Newport, Pontypool Road, Hereford and Shrewsbury. The latter route, of course, is jointly owned by the Great Western and London and North Western Companies between Hereford and Shrewsbury, but, as is well known, the principal North to West day expresses are all worked with locomotive power supplied by the Great Western Railway south of Shrewsbury. An additional feature of interest in these routes lies in the fact that the introduction of 4–6–0 engines has in each case been comparatively recent, and it is therefore possible to compare the work of these engines with that of the earlier 4–4–0 types hitherto employed. I will deal first with the runs on the Worcester route, which I have not tabulated, partly on account of the exceptional number of delays experienced and partly because the correspondents to whom I am indebted for the majority chose different points *en route* for taking their times, in no wise impairing the value of the logs themselves, but somewhat invalidating tabular comparison.

The two runs first described were made on the 1.40 p.m. from Paddington to Worcester—booked to cover the 120·4 miles' journey non-stop in 135 min. until January last, when it was amalgamated with the 1.45 p.m. down and altered to run in the times of the latter. Of these two the first, although dating back less than 5 years, was made behind none other than one of Mr. William Dean's 7 ft. 8 in. single-wheelers, No. 3060, with a substantial load of 10 eight-wheelers, mostly modern elliptical stock, and including one of the largest dining cars. The load behind the tender

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was thus 284 tons net, and not less than 305 tons gross, the train being full. Under these conditions *John G. Griffiths* took an abnormal time in "getting hold of them," as drivers say, requiring 24 min. 50 sec. to Slough, 18·5 miles; 45 min. 5 sec. to Reading, 36 miles; and 63¾ min. to Didcot East Junction, where a slight slack was made. Speed to this point had not exceeded 56 m.p.h.

Oxford, 63·4 miles, was run through in 74½ min.—5½ min. behind time—and then followed not only the customary slack at Wolvercot Junction, but also a permanent way slowing to 10 m.p.h. at Yarnton Junction, from which the single-driver recovered but slowly up the 1 in 180 beyond. Thenceforward to Moreton-in-Marsh the line is generally, although gradually, on rising grades, mainly between 1 in 315 and 1 in

GREAT WESTERN RAILWAY: HEREFORD—SHREWSBURY.

Distance.	Run No.		1	2		3	4	5		6	7	8
	Engine No.		—	—		*1972	4119	3834		†2906	2903	2983
	„ Name		—	—		*Hindustan*	*Wynnstay.*	*C'nty of S'm'rset*		*Lady of Lynn*	*Lady of Lyons*	*Red Gauntlet*
	„ Type	Schedule times.	4-4-0 'County'	4-4-0 "Bulldog"	Schedule times.	4-4-0 Compound	4-4-0 'Flower'	4-4-0 'County'	Schedule times.	4-6-0 'Saint'	4-6-0 'Saint'	4-6-0 'Saint'
	„ (tons) ..		190	220		225	280	330		240	380	420
Miles.		min	M. S.	M. S.	min	M. S.	M. S.	M. S.	min	M. S.	M. S.	M. S.
0·0	Hereford .. dep.	0	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00
7·5	Dinmore .. pass	—	10.00	12.10 a	—	11.30	12.15	10.29	—	9.50	10.50	11.00
12·6	Leominster .. „	17	16.20	19.00	16	17.10	17.50	16.00	16	15.05	16.08	16.30
18·9	Woofferton .. „	24½	23.15	26.20	23½	24.10	24.00	22.44	23½	21.30	22.31	23.00
23·5	Ludlow .. „	29	28.45	31.50	28	29.48	28.35	27.48	28	26.15	27.22	28.00
28·1	Onibury .. „	—	34.00	37.35	—	35.03	33.35	33.22	—	31.14	32.39	33.00
31·1	Craven Arms.. „	39	38.20	41.55	37	39.10	37.10	36.56	37	34.40	36.15	36.30
35·6	Marsh Brook.. „	—	44.20	48.40	—	45.46	43.12	42.28	—	40.16	42.15	42.00
38·2	Church Stretton „	50	48.00	52.30	48	50.27	47.30	46.00	47	43.40	46.25	46.30
44·6	Dorrington .. „	—	54.40	58.15 b	—	56.20	54.03 b	51.58	—	50.30	53.37	54.00
51·0	Shrewsbury .. arr.	68	64.45	67.30	65	64.25	64.05	61.37	64	60.50	62.49	63.30

* L. & N.W. Co.'s engine. † Piloted by 4-4-0 No. 3812, *County of Cardigan*. a—p.w. check, Dinmore Tunnel. b—Signals outside Shrewsbury.

GREAT WESTERN RAILWAY: SHREWSBURY—HEREFORD.

Distance.	Run No.		9		10		11	12	13
	Engine No.		†1956	Schedule times.	3824	Schedule times.	3822	3825	—
	„ Name		*Illustrious*		*County of Cornwall*		*County of Brecon*	*County of Denbigh*	—
	„ Type	Schedule times.	4-4-0 Compound		4-4-0 "County"		4-4-0 "County"	4-4-0 "County"	4-6-0 "Saint"
	„ (tons) ..		130		265		270	300	450
Miles.		min.	M. S.	min.	M. S.	min.	M. S.	M. S.	M. S.
0·0	Shrewsbury .. dep.	0	0.00	0	0.00	0	0.00	0.00	0.00
4·3	Condover .. pass	—	7.55	—	—	—	8.36	10.05	8.28
6·4	Dorrington .. „	—	10.31	—	—	—	11.31	12.52	11.05
9·3	Leebotwood .. „	—	14.36	—	—	—	16.16	17.16	15.05
12·8	Church Stretton „	21	20.42	21	22.35	20	23.19	24.06	22.42
15·4	Marsh Brook „	—	24.07 a	—	—	—	26.51	27.21	25.50
19·9	Craven Arms.. „	30	30.34	29	30.00	28	31.07	31.15	29.30
27·5	Ludlow .. „			37	37.15	36	39.03	37.53	35.55
32·1	Woofferton .. „			42	—	40½	series	42.40	40.55
38·4	Leominster .. „			49	49.25	47	of	49.18	47.15
46·8	Moreton-on-Lugg „			—	—	—	signal	58.42	56.01
51·0	Hereford .. arr.			65	64.15	63	checks	64.49	61.50

† L. & N.W. Co.'s engine. a—Signals, Stretford Bridge Junction.

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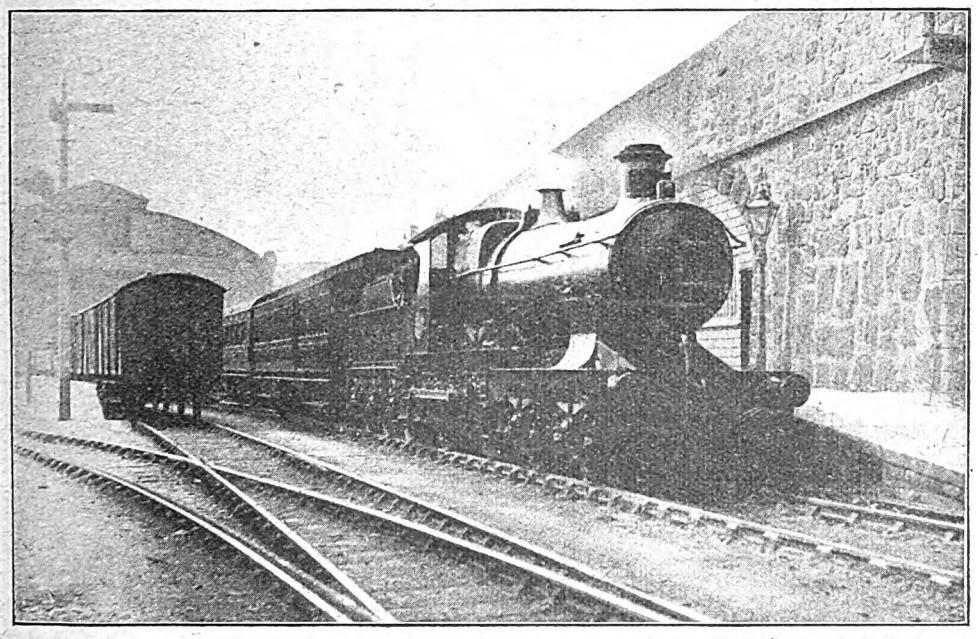
472; 26¼ min. were taken from Oxford to Kingham, 21·2 miles, where two coaches were slipped, reducing the load to 275 tons, after which the next 7 miles to Moreton occupied 8¾ min. The train was now 6¼ min. late, but, as is customary, very moderate speed was run down the steep 1 in 100 descent off the Cotswold Hills, at no point exceeding 66 m.p.h. So the 14·9 miles from Moreton to Evesham took 15½ min., but a fast finish was made from the latter town, the final 13·9 miles into Worcester occupying only 13 min. 51 sec. Between Kingham and Worcester, therefore, nearly 3 min. of lost time were regained, the gross time from London being 138 min. 36 sec. and the net about 136½ min. All circumstances considered, however, this was quite a good run, as the single-wheeler was decidedly overloaded.

A subsequent journey with a 4–6–0 engine, of which details have reached me from a valued friend and careful observer, furnishes an interesting comparison. Longer time was taken on the journey, but the run was cruelly delayed. No. 2902, *Lady of the Lake*, was the engine, with a tare load of 317 tons to Kingham and 234 tons beyond, or not less than 345 and 255 tons respectively, inclusive of a very heavy load of passengers and luggage. After an easy start, Southall, 9·1 miles out, was passed in 13 min. 9 sec., but speed had at this point risen to 60·4 m.p.h., and accelerated further to an average of 69·4 between mile-posts 17 and 18, Slough being passed in 21 min. 48 sec. Despite a slight signal check at Taplow, the 30th mile-post was breasted in 32 min. 42 sec. from the start, but then the trouble began. A signal check to 30 m.p.h. at Twyford was followed by a stop of 10 sec. at Sonning, another of 21 sec. at Reading East, and still a third of 1 min. 43 sec. at the east end of Reading station, the prolonged delay arising out of an ambulance train unloading at the main line platform. At the west end of the station, which was run through on the relief lines, there was almost another dead stand, but finally Reading was left behind, and the train transferred again to the main lines at Reading West, with a further 30 m.p.h. slack.



Photo] [*Frank Roberts.*

GREAT WESTERN RAILWAY.

Train leaving Penzance. Bulldog class 4–4–0 locomotive, No. 3349, *Lyonesse.*

Then from 30 m.p.h. at mile-post 37, speed rose to 37 m.p.h. at 38, 46·6 at 39, 52·9 at 40, 57·2 at 41½ and 61 at 43—a fine piece of acceleration with 345 tons. From posts 48–52 the rate was sustained at 67·4 m.p.h., but for all this when Didcot East Junction was passed, at 40 m.p.h. in 70 min.

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13 sec. from town, no less than 12 min. 43 sec. had been lost. Luck was still against the driver, as despite a maximum of 63 m.p.h. at mile-post 62, adverse signals brought the speed down to 30 m.p.h. through Oxford, passed in 82 min. 3 sec. from town. After slacking again to 40 m.p.h. through Wolvercot Junction, some remarkable work was done up the rising grades to Moreton, speed rising to a sustained 58·6 m.p.h. between mile-posts 76–77¼, and at no point on the ascent falling below 56. On the reduction of load by slipping at Kingham to 255 tons, speed at once rose to 60 m.p.h., and thereafter from mile-post 89 to mile-post 90 to 65 m.p.h. So the 6·5 miles from Oxford to mile-post 70 were covered in 9 min. 12 sec., the 14·7 miles thence to Kingham in 15 min. 39 sec.; and the 7 miles on to Moreton in 6 min. 41 sec. No advantage worth mentioning was taken of the falling grades beyond Moreton; speed did at one point rise to 75 m.p.h., but was immediately checked to 49, and shortly afterwards signal checks were again experienced, one at Littleton to 50 m.p.h., and a worse one at Evesham, to 30 m.p.h. So the 14·9 miles from Moreton to Evesham took 15 min. 14 sec., and the 13·9 miles thence into Worcester 16 min. 3 sec., the train being 9 min. 52 sec. late on arrival.

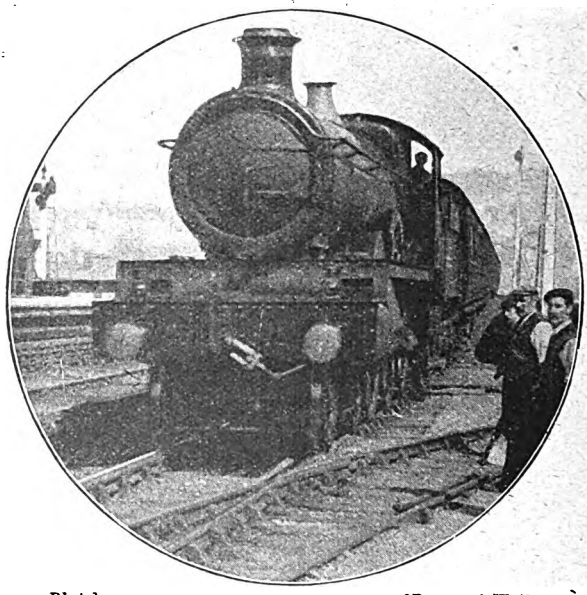

Photo [*Raymond Walker.*

GREAT WESTERN RAILWAY.

A down express approaching Bath. 4–6–0 locomotive, No. 2913, *Saint Andrew.*

But this total time of 144 min. 52 sec. for the 120·4 miles' journey included a modest total of seven signal checks, three dead stops for adverse signals, and two carefully observed service slacks, the actual running time being 142 min. 38 sec. Concerning these delays my friend writes: "When the Twyford slack began the series that culminated in the Reading stops, we were running at 63·3 and accelerating. If the 13 miles from post 30 to post 43, where 60 m.p.h. was regained, had been run at 64—which is not, I think, over the mark—they would have taken 12 min. 10 sec. They actually took 28 min. 41 sec., which means that 16½ min. were lost by these checks. The Oxford check I put at 1½ min., so that, disregarding the lesser delays, there was a net gain of 8 min. with a Christmas load and unfavourable weather, the net time being, on this basis, 65½ min. or a little less to Oxford, and 127 min. to Worcester." I do not know why such delays as the Littleton and Evesham checks should be passed over, as, in comparison with the previous run, they cost over 2 min., and would certainly reduce the net time for the 120·4 miles to 125 min.—an exceedingly fine figure with a very substantial load, and a rail greasy through mist.

From the same source there follows a run on the now long-suspended 4.45 p.m. from Paddington to Worcester, which was scheduled to complete the journey in 129 min. The engine was again a 2-cylinder 4–6–0—No. 2937, *Clevedon Court*, and the full load 165 tons to Moreton, and thence, after slipping, 136 tons forward. Right at the start there came a bad signal check at Westbourne Park, almost stopping the train, but then *Clevedon Court* got away well, attaining the mile-a-minute rate at mile-post 7, and covering the ensuing 20 miles in 17 min. 59 sec., at an average of 66·6 m.p.h. The top speed was 70 m.p.h. on this length, Slough being passed in 22 min. 55 sec. and mile-post 30 in 33¼ min. But at Twyford the express was brought to a dead stand, on account of permanent way operations, for 28 sec., the 31 miles from London having been run in 34 min. 33 sec. start-to-stop, inclusive of the Westbourne Park check. Re-starting, Reading, 5 miles,

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was passed in 7 min. 5 sec., and mile-post 50, 19 miles, in 20 min. 4 sec., the 10 miles between posts 40 and 50 occupying 9 min. 7 sec. At Moreton Cutting the train was transferred from the main to the relief line, this slack being added to the usual one at Didcot, while at Oxford the speed was brought down to 10 m.p.h. for relaying operations. Despite all these hindrances, Didcot East Junction was passed in 58 min. 32 sec. and Oxford in 69 min. 50 sec. from town.

After slacking at Wolvercot, some astonishing work was done uphill to Moreton-in-Marsh. Only 3½ miles beyond the junction taking 15 min. 3 sec., and the Evesham–Worcester section 16 min. 38 sec., although these times included a permanent way slack to 35 m.p.h. at Honeybourne on the former length, and a signal check to 20 at Norton Junction on the latter. The final slack just prevented the driver from keeping time, the gross running time to Worcester being 130 min. 13 sec., and the actual running time 129 min. 45 sec. But here also the actual time was inclusive of four bad checks, one stop, and three service slacks instead of the more usual two. My correspondent puts the net time at 120 min. or very little over.

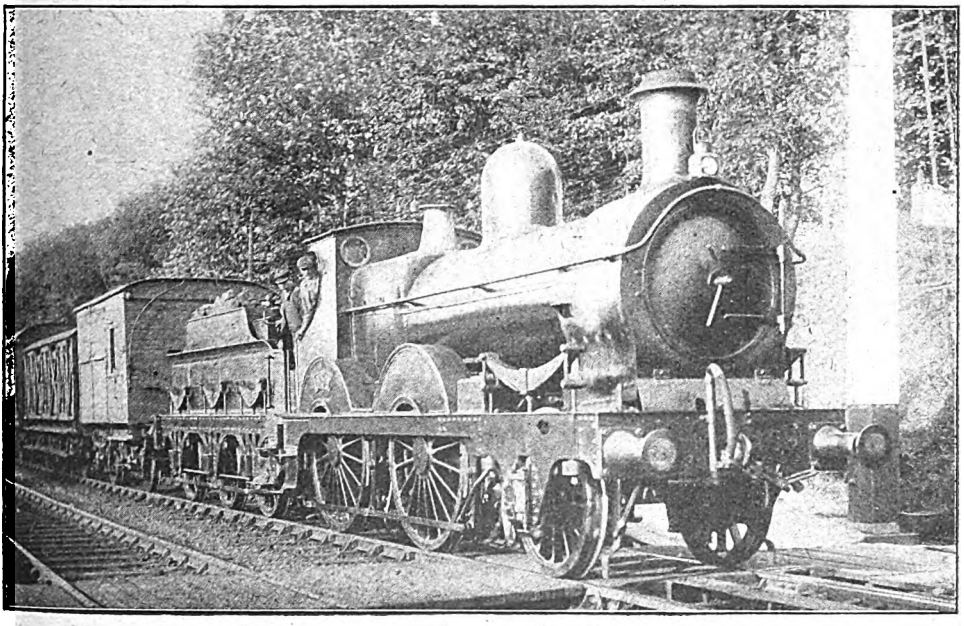

Photo [*Frank Roberts.*

GREAT WESTERN RAILWAY.
2–4–0 locomotive, No. 489, at Abergavenny.

speed had risen to 60 m.p.h.—despite an initial rise at 1 in 127–240–180—and then an average speed of 65·4 m.p.h. was maintained between the 70th and 90th mile-posts, this 20 miles' stretch occupying 18 min. 22 sec. The fastest mile (76–7) was covered at 69 m.p.h., and the slowest (73–74 and 82–83) at 64. So in this case the 6·5 miles from Oxford to mile-post 70 were run in 8¾ min., the 14·7 miles thence to Kingham in 13 min. 32 sec., and the 7 miles on to Moreton in 6 min. 25 sec., the two latter being most unusual times. Again no high-speed was attempted downhill beyond Moreton, the Moreton–Evesham length

My friend's third and last run was one on the 4.55 p.m. *ex*-Paddington, subsequent to the time when it was altered to convey a Worcester portion in addition to that for Birmingham. This, by the way, is one of the few unaltered trains in the new Great Western time-tables, retaining as it does a 70 min. schedule to Oxford. On the occasion in question the load to Oxford totalled the respectable figure of 350 tons, and was in charge of 2-cylinder 4–6–0 No. 2908, *Lady of Quality*. By way of contrast—rather violent contrast, indeed!—there were no delays on this run, and after a somewhat sluggish start of 12 min. 24 sec. to Southall,

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Slough was passed in 21 min. 19 sec., Twyford in 33 min. 20 sec., Reading in 38 min. 5 sec., and Didcot East Junction in 54 min. 28 sec., the last-mentioned at 40 m.p.h. No higher speed than 65 m.p.h. was attained—just before passing Slough—but the average rate between mile-posts 11 and 51 was 62·9 m.p.h. A very easy run in from Didcot completed the journey to Oxford in 68½ min. exactly.

On leaving Oxford the load had shrunk very considerably—to 170 tons—and the running thence was by comparison easy. The 6·5 miles to mile-post 70 were covered in 9 min. 28 sec., and the 14·7 miles thence to Kingham in 14 min. 28 sec., the train being then over a minute before time. Despite a pronounced easing of the engine, time was still gained slightly, the 7 miles from Kingham to Moreton—where the slipping of a coach further reduced the load to 141 tons—taking 7 min. 48 sec., the 14·9 miles from Moreton to Evesham 15 min. 54 sec., and the last 13·9 miles into Worcester 15 min. 7 sec. In this, as in all the foregoing cases, brakes were applied on the steepest parts of the descent from Campden Tunnel. So the 57 miles from Oxford to Worcester were covered in 62¾ min.—2¼ min. under schedule—making, with the time of 68½ min. from Paddington to Oxford a total running time of 131¼ min. from London to Worcester, or about 126 min. net, if allowance be made for normal running from Didcot to Oxford and no stop at the University town. "I believe," my correspondent adds, "that a 130 min. timing to Worcester could quite well be regained after the war by running the combined 4.55 p.m. train to Oxford in 67 min., allowing the Worcester portion 3 min. stop there (passengers for Oxford being put into the rear portion) and 60 min. thence to Worcester—an arrangement that would result in some saving of mileage." And, *apropos* of the runs just described, he adds: "There are undoubtedly some very keen drivers on the Worcester service"—a fact that obviously requires no further argument or substantiation.

By way of comparison I give details of three further runs on the 4.55 p.m. train from London to Oxford that have reached me from other sources, the engine in one case being again *Lady of Quality*, with a still greater load of 420 tons. The start was considerably slower than that last recorded, Southall being passed in 13 min. 50 sec., Slough in 23 min. 12 sec., Twyford in 35 min. 40 sec., Reading in 40¼ min., and Cholsey, 48·5 miles, in 52 min. Didcot East Junction was run through at reduced speed in 56 min. 25 sec., and Oxford was reached in exactly 70 min. from the start. On another and earlier occasion, before the combination of the 4.45 and 4.55 p.m. trains, *County of Worcester*—No. 3820—had a much smaller load of 225 tons, and performed some very fast work, the start being the smartest of any. Southall was passed in exactly 12 min., Slough in 20 min. 50 sec., Maidenhead in 26½ min., Twyford in 33 min., Reading in 37 min. 35 sec., and Cholsey in 49¾ min.—indeed quite a "Bristol two-hours" inaugural effort! After this delay was caused by the express being turned from main to relief lines at Moreton Cutting, in addition to the usual Didcot East Junction slack, but the latter point was passed in 55 min. 50 sec., and with smart running beyond Oxford was reached in the good time of 67¾ min., 2¼ min. early.

Finally, on yet another occasion, *Albara*, No. 4020, an inside-cylinder 4–4–0, had a substantial load of 330 tons, and put up some very creditable running. Southall was passed in 12 min. 53 sec., Slough—at no less than 68 m.p.h.—in 21 min. 41 sec., and Maidenhead in 26 min. 55 sec. Then the engine was eased perceptibly, the time to Reading being 38 min. 39 sec., and to Cholsey 51 min. 50 sec. Once again the train was crossed over at Moreton Cutting, and, passing Didcot East in 57 min. 5 sec., it came to a dead stand at Oxford South signals in 68 min. 10 sec. from town. This was equivalent to a time of 68½ min. to Oxford station, this average of 55·6 m.p.h. on the part of a 4–4–0 of so moderate dimensions, with a load of 330 tons behind the tender, being a highly creditable achievement. On an up journey with the corresponding "flier"—the 10.3 a.m., allowed only 67 min. to Paddington — No. 3405, *Mauritius*, of the same type, put up some still faster running, although the load was only one of six bogies, *i.e.*, about 160 tons in all. Didcot East, 10·6 miles, was passed in 12 min. 20 sec.; Reading, 27·4 miles, in 29 min. 20 sec.; Slough, 44·9 miles, in 46 min. exactly; and Westbourne Park, 62·2 miles, in 62 min., the time of 32 min. 40 sec. for the 34·8 miles from Reading to Westbourne Park being a smart one, although the speed at no point exceeded 65 m.p.h. Eventually, after a signal check at Royal Oak, Paddington was reached in 65 min. 8 sec. from Oxford, nearly 2 min. early. From such runs as

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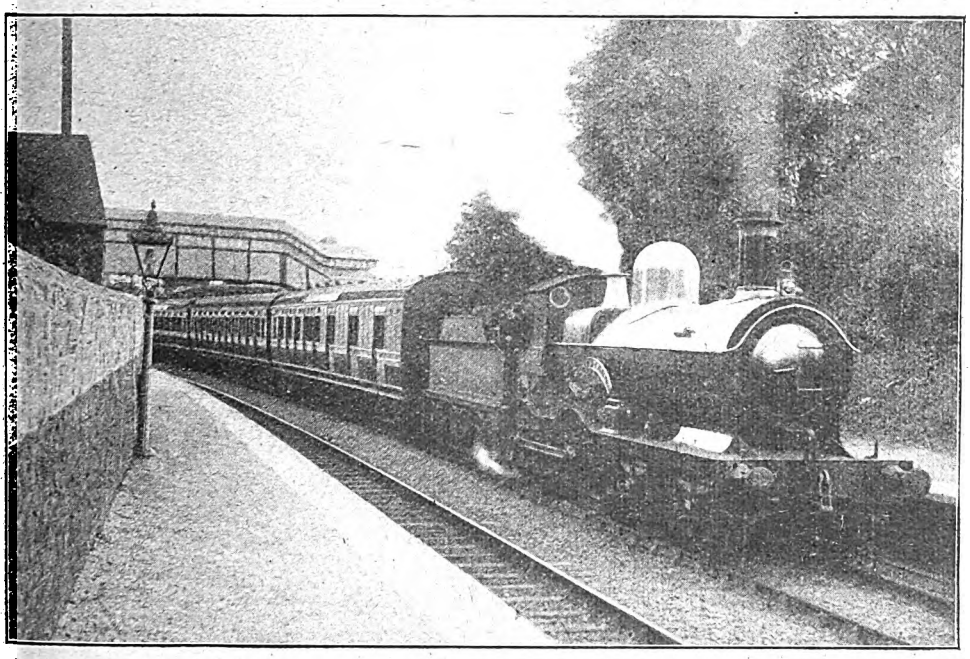
these it is quite evident that the "crack" running on the Great Western Railway is by no means confined to the West of England trains.

From Worcester it is not a far cry to Hereford, and thus we pass to the long-promised series of runs between Hereford and Shrewsbury. This route has of recent years become a centre of considerable interest, from the performance standpoint, not only because of the advent of the Great Western 4–6–0 engines on the expresses, but also in view of the vast loads that many of the principal trains have conveyed, on its way from the Valley of the Severn at Shrewsbury to that of the Teme at Ludlow. This ascent commences only ¾-mile out of Shrewsbury by 1⅝ miles up at 1 in 127, followed, after ⅝-mile undulating, by 1½ miles up at 1 in 154–134, broken by an intermediate "breather" in the shape of less than ¼-mile of level. Condover passed, there are 2⅛ miles of slight undulations to Dorrington, ⅜-mile north of which the ascent proper begins—5¼ miles almost all at 1 in 90–105. Then there follow ⅝-mile up at 1 in 215 past Church Stretton station, ¾-mile of level, and a final ⅜-mile up at 1 in



Photo] [*Frank Roberts.*

GREAT WESTERN RAILWAY.

London–Penzance express at St. Germans. Duke class 4–4–0 locomotive, No. 3289, *St. Austell.*

amounting at busy times to 14 or 15 bogie vehicles, and unpiloted. Some such runs are represented in the tabular statements appended. It is also worthy of note that the trains on this route are among the few that the overflowing scourge of time-table alterations has managed to pass by, some excellent timings being left in each direction without any alteration.

Before describing the runs, I may as well make a few remarks on the gradients. The chief physical feature of the route, of course, is the summit over which the railway passes at Church Stretton, in the Shropshire hills, 150 to the actual summit at Old Stretton. The southward descent is more broken. It begins with 5¼ miles, mostly at 1 in 112–100, to Stretford Bridge Junction, broken only by ⅜-mile up at 1 in 125 between Marsh Brook and Wenlock Junction; continues, after a sharply undulating 1¾ miles past Craven Arms, with a further 1⅜ miles down at 1 in 112 to Onibury, and 3⅜ miles gentle descent at 1 in 286–420–817–425 to Bromfield, whence ½-mile down at 1 in 100 brings us on to the level, or comparatively so.

The remainder of the journey has a generally falling tendency to Hereford, but

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there are some sharp undulations, notably 1¼ miles down at 1 in 131–112 between Ludlow and Woofferton; 1½ miles broken ascent, mostly at 1 in 100–115, from Woofferton, and a mile down at 1 in 104–154–288 beyond; 1¾ miles up at 1 in 302–204 to Dinmore Tunnel, with the subsequent 1¼ miles descent at 1 in 100 past Dinmore station; and, finally, 1¼ miles sharp descent at 1 in 78 with a further ¾-mile at 1 in 145–179 beyond Shelwick Junction practically into Barr's Court station at Hereford. On the whole the south-bound journey would appear the easier of the two, as, after the somewhat arduous climb of the first 13½ miles, there are no further difficulties, whereas in the north-bound direction, the gradients are against the engine, even if in less concentrated form, for the first 37½ miles. Further, the descent from Church Stretton into Shrewsbury is so winding in character that high speed is not attempted, whereas the southern slope is usually taken considerably more quickly.

Taking first the north-bound trains, we notice that the runs are divided into three groups, the first two journeys being on the 4.15 p.m. *ex*-Hereford, allowed the easy timing of 68 min., the next three on 65 min. trains, and the last three on the 11.26 a.m., the heaviest of all the expresses, although also the fastest, with an allowance of only 64 min. Little need be said concerning the runs. On Nos. 1 and 2, which were of my own timing, the work was sluggish, especially as in both cases the train was behind time. The "County" at no point exceeded 64 m.p.h., this being the speed attained in descending from Dinmore Tunnel, and the sustained rate on the final 1 in 112 to Stretton was exactly 40 m.p.h. The "Bull-dog" did even more feebly, especially in climbing, speed falling to 39 m.p.h. at the last-mentioned point, where one might have expected an engine with 5 ft. 8 in. wheels particularly to distinguish itself. But some brisk work was done down to Shrewsbury, speed rising in succession to 75, 72½ and 69 m.p.h., with intermediate slacks, and time was thus just kept. Allowing for the permanent way slack in Dinmore Tunnel, and adverse signals before Shrewsbury, the net time was about 65 or 65½ min.

For the next two runs I am indebted to a Preston correspondent, and for the fifth to an Ealing friend. Run 3 is of note in that the engine was one of the London and North Western Webb 4-cylinder compounds, on the 2.25 a.m. night express *ex*-Hereford, but the work was rather feeble, particularly on the ascending gradients. In this case also the loss of time uphill was regained by some fast running down into Shrewsbury, and the line being clear the train ran straight in without any delay. On run No. 5, *Wynnstay*, of the 6 ft. 8½ in. "Flower" class, did decidedly better with a considerably heavier load. The start was sluggish, but from Leominster to Ludlow the work was quite brilliant, the speed averaging over 60 m.p.h., and this fine effort was continued, indeed, right to Craven Arms, where the initial loss of time had all been regained. But on the 1 in 112 from Marsh Brook the rate fell to 33 m.p.h. A bad signal check was experienced before Shrewsbury, so that the net time works out at about 62½ min. The brilliant feature of *County of Somerset's* running in column 5 was the start, such a time as 16 min. out to Leominster not being by any means easy of accomplishment with adverse grades and such a load as 330 tons. That much accomplished, the "County" kept strict time to Craven Arms, and then achieved some really first-class climbing to Stretton, the 7·1 miles between these points occupying only 9 min. 4 sec., while my correspondent notes that the engine had plenty of steam throughout the ascent. Running down very moderately into Shrewsbury, *County of Somerset* nevertheless completed the journey in 61 min. 37 sec., or nearly 3½ min. under schedule time.

Last of all come the three runs with six-coupled engines, No. 7 of which reaches me from the Ealing friend last-mentioned, and Nos. 6 and 8 from a young friend at Colwyn Bay. Run No. 6 loses most of its interest in view of the fact that, although the load was very moderate, the train was piloted, No. 3812, *County of Cardigan*, officiating in this capacity. It is not possible to say what times the two engines might have achieved had they been "pushed," but in any case a time of 43 min. 40 sec. from Hereford to Church Stretton is a fairly surprising one, and even with faster running from there alone into Shrewsbury the journey would have been achieved in well within the hour. In the next column *Lady of Lyons* made some first-class running unpiloted with a very much heavier load. There is a close correspondence between this run and that of *County of Somerset* as far as Woofferton; then the 4–6–0 engine drew away in virtue of some brilliant work up the rising grades to Craven Arms, after which the "County"

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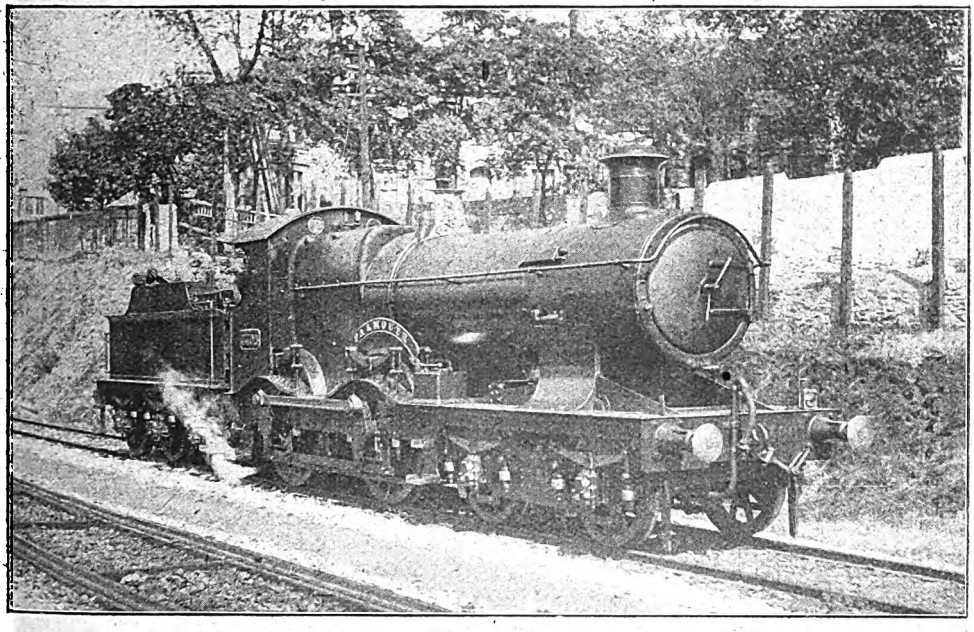
again had the best of it. The six-coupled engine ran much more slowly down to Shrewsbury, and so finished up with but little over a minute in hand. It would appear that No. 8 was by far the most brilliant run of the series, but, unfortunately, my young friend, who is at present in the earliest stages of timing enthusiasm, omitted to record his times to anything nearer than half-minutes, which divests them of a good deal of their value. This much is quite evident, however, that *Red Gauntlet's* work from Leominster to Church Stretton, despite the vastness of the load, which consisted of no less than 14 corridor bogie vehicles, was even faster than viously mentioned, and for No. 13 to our young Colwyn Bay enthusiast, while No. 10, which is somewhat barren in its particulars, reaches me from a Rochester friend. The first of this second series was made on a semi-fast to Hereford, and terminates at Craven Arms, but it is the only one illustrating the performance of a London and North Western locomotive—the 4-cylinder compound 1956, *Illustrious*. Light though the load was, the uphill work was not bad, speed rising to as much as 51 m.p.h. at Dorrington, after the short "breathing space" of easier grades from Condover, and being sustained at a steady average of 33–34



Photo] [*Frank Roberts.*

GREAT WESTERN RAILWAY.
Bulldog class 4–4–0 locomotive, No. 3308, *Falmouth*.

that of the run immediately preceding, and at Church Stretton no less than 1½ min. had been gained on schedule. But by ultra-cautious downhill running this amount was reduced to ½-min. on arrival at Shrewsbury. It is worth noting that on almost all of these runs, as an evidence of good hill-climbing, some time was economised, or, at the least, none was lost, on the uphill bookings from Craven Arms to Church Stretton.

The runs in the reverse direction are hardly so good, with the exception of No. 13. For details of Nos. 9, 11 and 12 I am indebted to the Ealing correspondent pre-

m.p.h. on the long 1 in 90–100 ascent. So Church Stretton was passed within the booked time of 21 min., and but for adverse signals outside Craven Arms, no difficulty would have been experienced in gaining on the 30 min. schedule. On run No. 10, *County of Cornwall*, with twice the load, fell to 26 m.p.h. on the 1 in 100, and after going sluggishly from Church Stretton down to Craven Arms, touched 70 m.p.h. between there and Ludlow, running closely to schedule and reaching Hereford ¾-min. early. This run was on the 5.0 p.m. train *ex*-Shrewsbury, allowed 65 min. for the journey.

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The remaining three runs were on the important 11.5 a.m. express, which is allowed the "crack" South-bound time of 63 min. Both the two "County" class engines were unable to observe this booking, although on run 12 *County of Denbigh* would have kept time but for an initial permanent way check to 10 m.p.h. at the first mile-post out of Shrewsbury. After that a speed of 47 m.p.h. was maintained on the easy 2 miles before Dorrington, while on the 1 in 100 an even rate of 28·6 to 29·8 m.p.h. was kept up. With the fairly substantial load of 300 tons the net time of about 22½ min. to Church Stretton was not bad. After that the highest speeds were 76½ m.p.h. through Craven Arms, and 73½ beyond Onibury, the 12 miles between posts 15 and 27 (roughly, Marsh Brook and Ludlow stations) being covered in 10 min. 20 sec., at an average of all but 70 m.p.h. But the running after that was very moderate in character. *County of Brecon* did poorly throughout, and bade fair to arrive well behind time when signal checks beyond Ludlow relieved the driver of any further anxiety on that score.

All the runs, of course, are completely eclipsed by the magnificent effort of the "Saint" in column 13, and I only wish I had fuller details of this remarkable run at my disposal. Such a time as 20 min. out to Church Stretton is quite a "counsel of perfection" with any decent load, but with 15 bogies of modern stock it is quite astonishing to see the ascent made even in 22 min. 42 sec. without any pilot assistance. From Condover to Leebotwood the times correspond closely with those of the London and North Western compound *Illustrious*, after which the speed must have fallen very rapidly on the 1 in 100—and no wonder! Then followed some very fast downhill work, the time of 10 min. 5 sec. for the 12·1 miles from Marsh Brook to Ludlow in particular being worthy of notice, while excellent work continued onwards through Leominster. The prescribed slack to 50 m.p.h. through Ludlow in this direction appears to have been carefully observed. As a result of this splendid running, nearly 4 min. were gained on schedule between Church Stretton and Hereford, and thus the express, which was running very late, and was simply packed with passengers, gained over a minute on booked time.

En route to South Wales, I may as well mention one or two runs between Hereford, Pontypool Road and Newport before touching on the South Wales main line proper. Several of them were preliminary to or continuations of the runs already described. The gradients on this stretch are terribly severe, and more particularly so for south-bound trains. Out of Hereford there is a level start for a mile to Rotherwas Junction, followed by an ascent of 2¼ miles at 1 in 220–143–92–104 to Red Hill Junction, and a further mile at 1 in 104 to the first summit. From there ensue 8¾ miles of moderate undulations to a point ½-mile south of Pontrilas, where begins the ascent of Pandy bank—3⅜ miles at 1 in 216–170–204, followed by 3 miles at 1 in 110–95–100, Llanvihangel station being situated at the summit. Then comes a tremendously sharp drop past Abergavenny —1¾ miles at 1 in 94, 2¼ at 1 in 81–85, and 2½ at 1 in 153–184–154, leading to Penpergwm, where a 50 m.p.h. service slack is in force. The ascent of 1½ miles at 1 in 50 beyond Penpergwm is the steepest grade on the section; after ¾-mile of level it is succeeded by ¾-mile up at 1 in 119, and that, again, after 1¼ miles down at 1 in 141, by a rise of 2 miles at 1 in 103 to Pontypool Road, from which station there is a good start in both directions. Southward, there is a drop of 4 miles at 1 in 95–106, and 2 at 1 in 120 to Ponthir, after which the line is practically level to Newport, but all the latter stretch must be taken cautiously as there are many curves and junctions.

I have only details of one south-bound journey—in continuation of that in the 5.0 p.m. *ex*-Shrewsbury given in column 10—and they are somewhat incomplete. *County of Cornwall* received an addition of two more 8-wheelers at Hereford, bringing the load up to 325 tons, and thus laden passed Tram Inn, 6·8 miles, in 13¼ min.; Pontrilas, 12·5 miles, in 19 min. 25 sec., at a speed of 61½ m.p.h.; Llanvihangel, 20 miles, in 30 min. 35 sec. (the minimum rate on Pandy bank being 23 m.p.h.); and Abergavenny, 24 miles, in 35 min. 35 sec. Very moderate speed must have been run down from Llanvihangel, but the time at Penpergwm is not given in the log. Pontypool Road was reached in 48 min. 50 sec., against the 50 min. allowed, the train being also 1 min. 25 sec. behind time at Pontrilas, and 25 sec. before it at Abergavenny.

In the reverse direction, also, the loads were in most instances heavier than those between Hereford and Shrewsbury, owing to the provision on the trains of through vehicles from South Wales for Birmingham. On the early part of No. 1 run the "County" class engine, of whose name and number I

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have no record, had thus three additional bogie vehicles to Hereford, and the total weight of the train was fully 275 tons. A speed of 72½ m.p.h. was attained before Penpergwm, which place, 6·7 miles from Pontypool Road, was passed at reduced speed in 8 min. 40 sec., while the 9·4 miles to Abergavenny took 12 min. 20 sec., instead of the 12 min. allowed. Up the ascent to Llanvihangel the lowest rate was 26 m.p.h., the 4 miles up from Abergavenny taking 8 min. 25 sec., and a speed of 70 m.p.h. was again reached before Pontrilas, which was passed in 28 min. 20 sec. (20·9 miles). Speed was moderated here also. We were now ¾-min. before time, but signal checks followed, and the total time for the 33·4 miles to Hereford was actually 47 min. 20 sec. But the net time was 43 min., or 2 min. less than schedule. On the preliminary stage of No. 2 run the load was the same from Pontypool Road—230 tons—but engines were changed at Hereford, the engine over the earlier section being a 6 ft. 8 in. inside cylinder 4–4–0, No. 3718, *City of Winchester*. Penpergwm was passed in 9 min.; and Abergavenny in 12 min. 25 sec., while an excellent ascent to Llanvihangel resulted in the 4 miles from Abergavenny to the summit being covered in 7¼ min. The mile-a-minute rate was not reached before Penpergwm, by virtue of very cautious running, and the maximum before Pontrilas was only 64 m.p.h., but the minimum at Llanvihangel summit was good, being as high as 31 m.p.h. Pontrilas was passed in 27 min. 35 sec., but adverse signals brought us to a dead stand at Red Hill Junction, in exactly 38 min. from Pontypool Road, 30·1 miles distant. The allowance to this point is 33 min., and we should have reached Hereford, without delay, in 43 min.

Wynnstay, 6 ft. 8 in. inside cylinder 4–4–0, on the earlier part of run 4, had a load of 11 bogie vehicles, or 310 tons, and so was given the assistance of a small 2–4–0 pilot —No. 587—as far as Hereford. Under these conditions Penpergwm was passed in 8¾ min., Abergavenny in 12 min. 13 sec., Llanvihangel in 20 min. 10 sec., Pontrilas in 28 min. 53 sec., Tram Inn, 26·8 miles, in 34 min. 42 sec., and Hereford, 33·4 miles, was reached in 44 min. 25 sec., against a booked time, in this instance, of 45 min. The ascent of Abergavenny bank, in consideration of the pilot assistance, was not particularly good, the time from Abergavenny to Llanvihangel being 7 min. 57 sec., and the lowest speed 26½ m.p.h. On the next run *County of Cardigan* and *Lady of Lynn* had the easiest of tasks with ten bogies, or 285 tons. Penpergwm was passed in 8¾ min., Abergavenny in 12 min. 5 sec., Llanvihangel in 18 min. 25 sec., Pontrilas in 26½ min., and Tram Inn in 32¼ min., while Hereford was reached in 42 min. 23 sec., against 45 min. scheduled.

The timing of No. 3 run commenced at Maindee North Junction, Newport, where the 12.37 a.m. train from Cardiff is joined to the 12.27 a.m. from Bristol for the journey northward. From there, with the ample allowance of 63 min. for the 42·6 miles to Hereford without intermediate stoppage, No. 3399, *Ottawa*—a 5 ft. 8 in. "Bulldog"—had a simple task in working 225 tons on to Hereford to time, but even then contrived to drop over 2 min. Pontypool Road, 9·2 miles, was passed in 17¾ min.; Penpergwm, 15·9 miles, in 26 min. 48 sec.; Abergavenny, 18·6 miles, in 30 min. 40 sec.; Llanvihangel, 22·6 miles, in 39¼ min., Pontrilas, 30·1 miles, in 47 min. 25 sec.; and Tram Inn, 36 miles, in 56 min. 25 sec., Hereford being reached in 65 min. 25 sec.—a signally feeble effort. But on a more recent run of my own timing, on the now cancelled 7.45 p.m. train from Newport to Hereford—booked non-stop over this 43·2 miles in 61 min., No. 3323, *Etona*, of the same type, put up some much better work, although having only the modest load of 130 tons behind the tender. Ponthir, 4·2 miles from Newport, and the starting-point of the ascent to Pontypool Road, was passed in 7 min. 5 sec.; Pontypool Road, 9·8 miles, in 16 min. 10 sec.; Penpergwm, 16·5 miles, in 23¼ min.; Abergavenny, 19·2 miles, in 26 min. 50 sec.; Llanvihangel, 23·2 miles, in 34¼ min.; Pontrilas, 30·7 miles, in 41 min. 5 sec.; and Red Hill Junction, 39·9 miles, in 51¾ min., Hereford being reached in 56 min. 40 sec., or 4 min. 20 sec. before time. Not only was the uphill work good, but the downhill speeds were particularly high for this type of engine. The maximum rates touched were 70 m.p.h. before Penpergwm, where the regulation slack was carefully made, and a sustained 74 before Pontrilas, where the speed also was eased. Similarly, the time of 7 min. 25 sec. from Abergavenny to Llanvihangel, with a minimum speed of 31 m.p.h., was quite a good one, as was that from Pontypool Road to Red Hill Junction —30·1 miles of difficult grades, which consumed only 31 min. 35 sec. Thus on these "by-ways" some quite excellent work is performed at all times.

Considerations of space now forbid me to describe the whole of a journey from

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Paddington to Carmarthenon the 11.30 a.m. express, details of which have reached me, strangely enough, from a correspondent "Somewhere in France," and I must reserve the London–Cardiff portion of the run in question for a forthcoming issue, in which I hope at the same time to deal with some exceptionally fine performances between London, Bristol and Exeter. I will, however, utilise the present opportunity to reproduce the log of the train above-mentioned on the less frequently mentioned section of the South Wales main line beyond Cardiff. The engine on this occasion was the four-cylinder 4–6–0, No. 4039, *Queen Matilda*, and the load a heavy one of twelve corridor eight-wheelers. My correspondent estimates the weight roughly at 360 tons, but if, as has generally been the case, the composition of the train included a number of the 70 ft. vehicles, the gross load with passengers and luggage was probably more nearly 400 tons —a very substantial train for the heavy gradients of this section.

The start from Cardiff was an excellent one, St. Fagan's, 4 miles, being passed in 7 min. 28 sec.; Llantrissant, 11·1 miles, in 16 min. 21 sec.; and Llanharan, 13·5 miles, in 20 min. 19 sec. Practically all the distance is on rising grades, steepening at the last to 2¾ miles mainly at 1 in 161–187, and 1¼ miles at 1 in 106, on which the speed fell to 29 m.p.h. The 6·7 miles from Llanharan down to Bridgend, where a slack was made, took 7 min. 10 sec. After this follows the ascent to Stormy Siding—3 miles at 1 in 132–163 —on which the rate fell to 33 m.p.h., Stormy, 24·2 miles from Cardiff, being passed in 33 min. 51 sec., and Pyle, 25·7 miles, in 35 min. 35 sec. The 6·7 easy miles thence to Port Talbot occupied 6 min. 13 sec., and the 5·6 miles on to Neath stop 7 min. 3 sec., making a total of 49 min. 1 sec. for the 37·9 difficult miles from Cardiff. For this distance the booked allowance is 50 min. The start from Neath is exceedingly steep, being as it is for 1¾ miles continuously on an adverse grade of 1 in 99–88. But *Queen Matilda* did valiantly, covering the first ¾-mile of the grade in 2 min. 7 sec., the next ½-mile in 81 sec., and the succeeding two quarters—on the 1 in 88—in 40 and 38 sec. respectively, total 4 min. 46 sec. for the 1¾ miles. As will be seen, the acceleration was constant, the final ¼-mile being covered at 23½ m.p.h. Landore, 6·7 miles from Neath, was reached in 13 min. 5 sec., start-to-stop, 12 min. being allowed.

At Landore two bogies were detached, leaving about 330 tons to go forward, and for the ascent of Cockett bank—1½ miles at 1 in 52, and ¼ at 1 in 63—bank engine assistance was provided in rear in the shape of a 2–8–0 tank locomotive. Thus energetically attended to in rear, the train surmounted the 2·1 miles to Cockett in 5 min. 55 sec., and, after a stop of 82 sec. at the summit to detach the "pusher," the succeeding 8·4 miles to Llanelly were covered in 10 min. 23 sec., start-to-stop. This gave a total time of 17 min. 40 sec. from Landore to Llanelly, as compared with an allowance of 19 min. Shorn of yet one further coach, and now reduced in weight to about 300 tons, the express proceeded from Llanelly to pass Pembrey, 3·9 miles, in 6 min. 50 sec.; Kidwelly, 9·2 miles, in 11 min. 55 sec.; Ferryside, 13·4 miles, in 15 min. 48 sec.; and mile-post 244, 18·7 miles, in 20 min. 38 sec., the time of 13 min. 48 sec. for the 14·7 level miles from Pembrey to mile-post 244 being especially good. The remaining 1·7 miles into Carmarthen took 4½ min., owing to a signal check and the usual slack at Myrtle Hill Junction, but even then the time for the 20·5 miles from Llanelly was only 25 min. 8 sec., or nearly a minute under that scheduled, and the net time was more nearly 24 min. Thus, by most praiseworthy work, the driver had time to his credit on almost every section of the journey, despite the difficulties of a hard road, and loading that was decidedly onerous.

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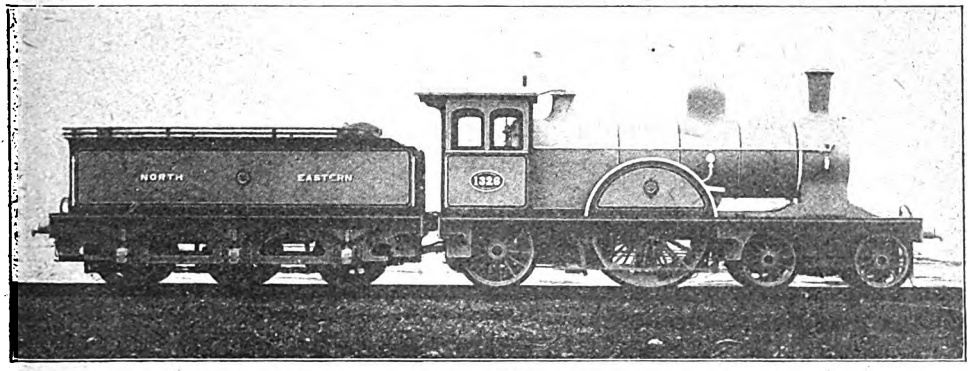
Locomotive and Train Working in the latter part of the 19th Century.

NORTH EASTERN RAILWAY. [No. VII.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 275, *April* RAILWAY MAGAZINE.)

WITH regard to the compound passenger engines they undoubtedly did some good work. My own experiences with them were entirely on secondary expresses and fast trains, but never with the main line East Coast trains, which were then the only ones of which the speed timings were worth recording. In spite of the lower exhaust pressure, they had a harsh and noisy beat, which I noted repeatedly in comparison with the much softer beat of the "Fletchers" and "Tennants." But the terminal exhaust pressure is not the only factor which influences this, for there were of course only two beats per revolution in place of four, and consequently each beat had to get rid of a much larger quantity of steam. The blast pipes were, if my particulars are accurate, $5\frac{3}{4}$ in. in diameter, as against about 5 in. for the simple engines.



NO. 1326, CLASS I, 4-2-2 TWO-CYLINDER COMPOUND EXPRESS ENGINE. GATESHEAD, 1888-9.
Wheels, 7 ft. 1 in. Cylinders, 18 in. and 26 in. by 24 in.

It is now time to look into the improvements in the North Eastern train services. In 1888 the tourist express, the 8 p.m. from King's Cross, was timed as follows:—York dep. 12.5 a.m., Newcastle arr. 1.47 a.m., speed 47·3 m.p.h. Leaving Newcastle at 1.52, it ran through to Edinburgh, $124\frac{1}{2}$ miles, in 2 hours 53 min., a rather poor speed of 43 m.p.h. This was the longest run of the North Eastern and at that time in this country. The two Midland runs from St. Pancras to Nottingham, $123\frac{3}{4}$ miles, ran it very close as far as distance was concerned, but were infinitely superior as regards speed, for the time taken was 29 min. less. Since 1880–3 there had, until July, 1888, been only a slight increase in speed, but there was a larger number of fast trains. For instance, there were five trains between Leeds and Hull stopping at Selby, which averaged 1 hour 17 min. to 1 hour 18 min. Between York and Scarborough the number of fast trains had increased to 22. Of these 13 had a mean timing of 66 min., at a running average exclusive of stops, of nearly 41 m.p.h. Of the 13 trains between York and Edinburgh, the mean speed exclusive of stops gave a running average of only 44·5 m.p.h.

The month of August, 1888, was, however,

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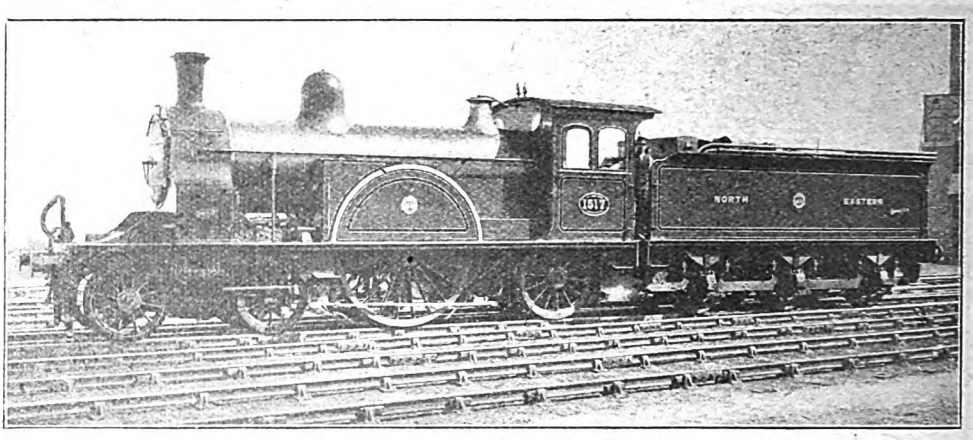

Photo] [*Locomotive Publishing Co., Ltd.*

NO. 1517, J CLASS, COMPOUND EXPRESS ENGINE. GATESHEAD, 1889.
Wheels, 7 ft. 7¼ in. Cylinders, H.P., 20 in. by 24 in., L.P., 28 in. by 24 in.
All these were converted about 1894 to simple engines.

historical in that the first of the two races to Scotland took place. I will not take up space by going into great detail on the subject of the racing trains. The trains in question were the two down expresses which left King's Cross and Euston at 10.0 a.m. for Edinburgh. The average load of the East Coast train was about 100 to 105 tons, and between York and Newcastle it was run alternately by a "Tennant" 7 ft. coupled and one of Mr. Worsdell's 6 ft. 8 in. compound engines.* The time allowance for the 80½ miles was 93 min., and the average time actually taken throughout the race was 86·2 min., from which 2·6 min. delay per trip were deducted, making the mean net running time 83·6 min. The fastest run was performed by a "Tennant" and was officially stated to have been made in 78 min. with seven coaches, but there seems to be some doubt as to whether this was actually done. Certain it is that No. 1475, one of the "Tennants," ran the 80½ miles in 81 and 82 min. on two occasions, and on August 31st, the last day of the race, the same engine made the journey in 83¾ min., with a dead stop at Ferryhill of 1¾ min.

Between Newcastle and Edinburgh the 6 ft. 8 in. compounds No. 1 class were exclusively used. The time allowance for the 124½ miles was 152 min.; the trains actually averaged 141·7 min. gross, or 139·7 min. net, allowing for delays on the road. The fastest time was made by compound engine No. 117, which is stated to have covered the distance in 125 min. according to one authority, and 126 min. according to another. In any case it was an excellent performance and showed that the compounds could run well. The official figures, however, for the last day's run of the racing trains were as follows:—

York	..	dep. 1.49 p.m.
Darlington	..	pass 2.33½ ,,
Newcastle	..	arr. 3.12¼ ,,
,,	..	dep. 3.17 ,,
Berwick ..	..	pass 4.26 ,,
Edinburgh	..	arr. 5.26¾ ,,

This schedule makes the record for August 31st as 129¾ min. between Newcastle and Edinburgh, *i.e.*, a third contradictory timing, but probably the most nearly correct one.

I leave it at that; either there were three observers with three different clocks or an equal number of different mentalities, or there must have been three trains! I was tied up by other duties on the Great Western, or I would have sampled the running of some of these racing trains, but I can remember that some years afterwards the late Mr. Rous-Marten commented to me on the considerable discrepancies in the actual timings.

In the summer of 1891 there were six down East Coast expresses. Of these the two night trains ran from York to Newcastle in 100 and 99 min. respectively, and took the 124½ mile stretch from Newcastle to Edinburgh in 2 hours 50 min. and 2 hours 46 min. respectively. The 10.0 a.m. from King's Cross left York at 2.5 p.m. and reached Newcastle at 3.42 p.m., a time allowance of 97 min., and a

* This was the official statement, but I believe the Tennants did much the larger share of the work between York and Newcastle.

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speed of 49·8 m.p.h. The train reached Edinburgh at 6.30 p.m. with a five minutes' stop at Berwick. The time allowance from Newcastle to Berwick, 67 miles, was 81 min. (speed 49·6 m.p.h.) and from Berwick to Edinburgh, 57½ miles, 77 min. (speed 44·8 m.p.h.).

The 2.20 p.m. from King's Cross stopped in 1891 at both Thirsk and Darlington, but ran through from Newcastle to Edinburgh in 2 hours 38 min. (speed 47·3 m.p.h.).

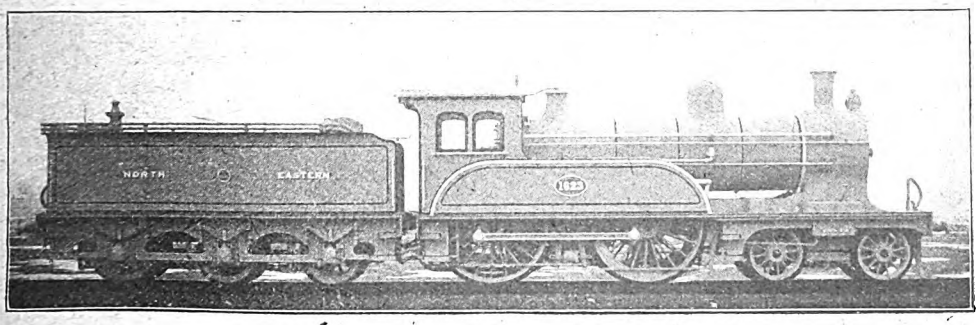
On the up journey all trains stopped at Berwick and several at Dunbar. The best time (the 10 a.m. and 2.30 p.m. from Edinburgh) to Berwick was 65 min. and from Berwick to Newcastle the 10.0 a.m. took 80 min. There were two runs through from Newcastle to York, both of which were performed in 100 min. The best timing from Darlington to York was 51 min. for the 44 miles made by the 10.0 a.m. from Edinburgh.

On the Leeds York and Scarborough section there were five trains in 1891 which ran from Leeds to York, 25½ miles, in 40 min. The North Eastern never seemed able or willing to give a faster run over this fairly easy section, and the time-table gentleman also managed to get in a little bit of his own by giving the 2.0 p.m. from Leeds a through run of 50 min. for the 25½ miles. The why and the wherefore of this last outburst I do not know. In the opposite direction from York to Leeds (Marsh Lane), 24¾ miles, the time allowance varied from 37 min. for two trains to 40 min. for others. But there was one alteration at least, viz.: the 1.10 p.m. from Leeds, which disdainfully gave the cold shoulder to the ecclesiastical city and ran through to Scarborough, 67⅝ miles, in 1 hour 45 min. The average booked speed of this performance was 38·6 m.p.h. and of course included the dead slow through York and over the north junction crossings. The best run from York to Scarborough was that of the 2.30 p.m., which covered the 42 miles in exactly one hour. In the opposite direction all trains stopped at Malton, but the 10.45 a.m. from Scarborough ran through from Malton to Leeds, 46¼ miles, in 82 min.

Between Leeds and Hull there can hardly be said to have been any improvement of importance, except that the 9.30 a.m. from Hull went through to Leeds (Marsh Lane), 51 miles, in 1 hour 12 min. with a 2 min. stop at Selby. This train was allowed 40 min. for the 31 miles from Hull to Selby, and was by far the best on this section.

A new line had been opened from Market Weighton to Driffield in order to shorten the route from Leeds, etc., to Bridlington, a growing and very popular seaside town on the Yorkshire coast. Bridlington was a very nice place when you got there, but you had to get there, and prior to the opening of the new line passengers travelled either in the Scarborough trains and were turned out with all their impedimenta at Seamer Junction, or they had to travel round the other side of the triangle *viâ* Hull. Then some investigator at York discovered that according to Euclid one side of a triangle was occasionally shorter than the other two combined, and the Company having taken note of the discovery set about making the new line. The result was a series of new fast trains from Leeds to Bridlington direct, which stopped at Selby, and the majority of them also at Driffield.

The Leeds, Harrogate and the North service did not show great improvement except for an extra Newcastle–Liverpool express in each direction. Holbeck Junction was still a great impediment, though the Leeds and Harrogate evening business express at



NO. 1623, CLASS M1. BUILT AT GATESHEAD, 1892–3.
Wheels, 7 ft. 1 in. Cylinders, 19 in. by 26 in.

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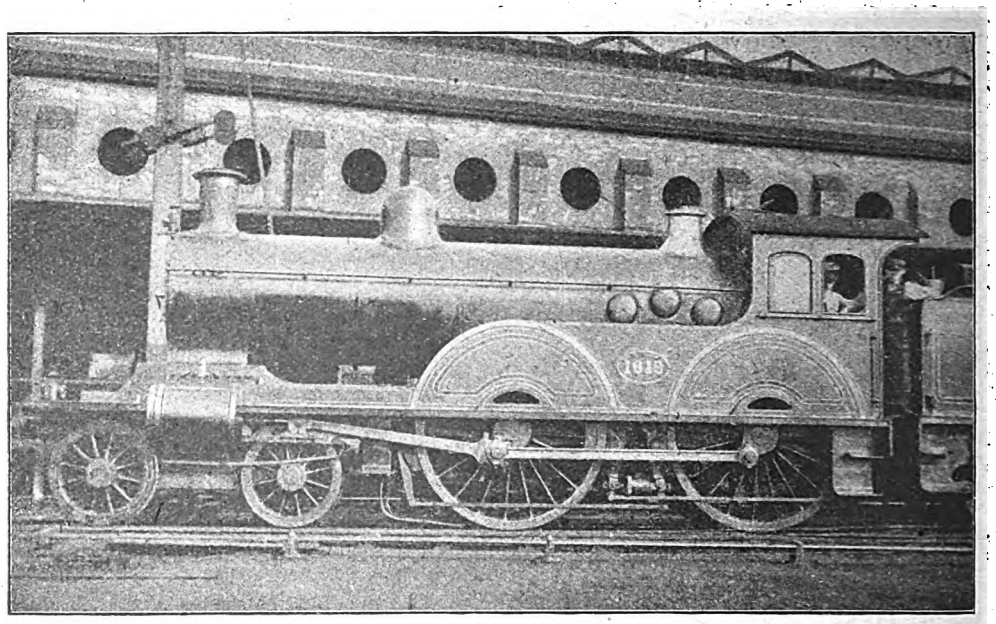

NO. 1619. THREE-CYLINDER COMPOUND (SMITH'S SYSTEM).
Reconstructed 1898 from two-cylinder compound engine.

5.20 p.m. now cut it out, and ran through to Harrogate in 30 min.

From 1888 Mr. T. W. Worsdell continued to construct compound engines and they issued from Gateshead and Darlington works until 1892, when the era of the 2-cylinder compound on the North Eastern ceased. Following the 37 coupled engines of the D, F and F1 classes, the year 1888 saw the appearance of "singles," none of which type had been built for the line since 1862. Two years previously Midland experimenters had invented the sand blast, and this was followed on many lines by a revival of the single express engine. The North Eastern, however, was the only company which constructed them on the compound system. The two new engines—Class I—were Nos. 1329 and 1330, and some months afterwards, in 1889, there followed Nos. 1326 to 1328, and in 1890 five more, Nos. 1527 to 1531, making a set of ten engines of the class. They may be described as an adaptation of the 4–4–0 compounds or No. 1 class of 1887 into 4–2–2 engines, in which single driving wheels 7 ft. 1¼ in. diameter, and trailing wheels 4 ft. 7¼ in. diameter with inside bearings replaced the coupled wheels. But in one important respect they were inferior to the coupled engines. Although the H.P. cylinders 18 in. by 24 in. and the L.P. cylinders 26 in. by 24 in. were the same as in the coupled engines, the heating surface of the new engines was only 1,136 sq. ft. as compared with 1,323 sq. ft. in their predecessors. The working pressure was 175 lbs. per sq. in.

The first five of these engines worked for some time on the Newcastle and York main line, and were stationed at Gateshead, but after about two years they were replaced by the larger singles, class J. But the five engines of 1890—Nos. 1527 to 1531—did not within my recollection do much if any of the York and Newcastle main line work, for Nos. 1529 to 1531 were sent to Leeds, and ran to West Hartlepool, and also on the Leeds–Newcastle service *viâ* Sunderland. Why this was so arranged I do not know, for the Leeds Northern road is hardly the one to suit the capabilities of single engines.

In 1900–2 the ten engines were rebuilt as simple engines with 18 in. by 24 in. cylinders. The Joy valve gear was removed, and piston valves with link motion substituted. An improvement was also made in adding outside framing and bearings to the trailing wheels, thus giving them longer bearings, and removing the latter further away from the heat of the firebox. For a short period they ran on the Scarborough and Leeds trains, but for a long time some have been stationed at Hull, and may be seen on the most important fast trains from Hull to Leeds and to Doncaster.

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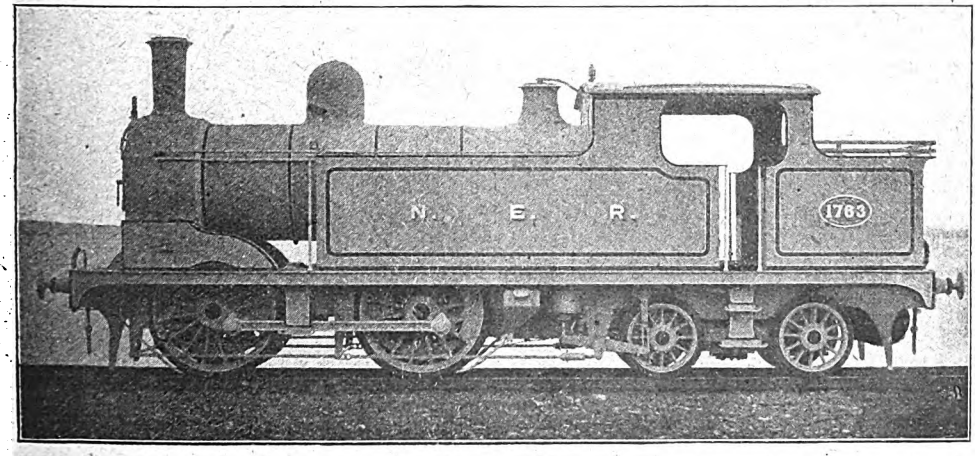
Following the above there appeared in 1889–90 ten still larger single engines, also 2-cylinder compounds. These were Nos. 1517 to 1526 with 7 ft. 7¼ in. driving wheels, leading bogies, inside frames to all wheels, and larger cylinders. The H.P. cylinders were 20 in. diameter, and the L.P. cylinders 28 in. diameter with a common stroke of 24 in. In order to accommodate such large cylinders between the frames, the former were not placed on the same horizontal centre line, and the L.P. cylinders on the right hand side were at a higher level and inclined in such a way that the centres of the crank pins on the driving axles remained at the standard distances apart. Apertures were cut in the side frames, and the steam chests were placed outside, the valves in them being worked through the intermediary of rocking shafts connected to the inside Joy valve gear. The boilers were of small size, having a tube heating surface of 1,016 sq. ft. and a firebox surface of 123 sq. ft., giving a total of only 1,139 sq. ft. The pressure was 175 lbs. per sq. in., and the total weight of engine in working order was 46 tons 13 cwt., of which 17¾ tons was carried by the driving wheels. The tenders were larger than any which had up to then been made for any British railway and carried 3,940 gallons of water. One of these engines attained a speed of 86 m.p.h., when it indicated 1,068·6 H.P. with a cut off in the H.P. cylinder of 53 per cent., and in the L.P. cylinder of 70 per cent. The total weight of the train including engine and tender was 310 tons 6 cwt., so that the weight of the train would be about 223 tons. The line at the point where this performance was registered was level.

Nevertheless as far as the compound principle was concerned they suffered the fate of their predecessors, and in 1894–5 they were converted to similar simple engines with 19 in. by 24 in. cylinders and outside bearings to the trailing wheels. It was stated that the exposed position of the outside steam chests gave trouble and occasioned cracks in them, so that, when they were converted, this position was abandoned in favour of inside piston valves. They worked before and after their conversion on the main line expresses between York and Edinburgh, but have since been relegated to the Scarborough, Leeds and Bradford through fast expresses, and also work the North Eastern service between Hull and Sheffield (Midland).* During the Scotch racing of 1895 these engines (after their conversion to simple engines) were frequently used. On one occasion No. 1522 ran from York to Newcastle, 80½ miles, in 79 min. 54 sec. But I shall deal with these trains shortly.

In 1892–3 Mr. Wilson Worsdell, who had succeeded his brother of compound fame, put to work 21 4–4–0 express engines with 7 ft. wheels, of which 20 (Nos. 1620 to 1639) had simple 19 in. by 26 in. cylinders, and one (No. 1619) was a two-cylinder compound with cylinders 20 in. and 28 in. by 26 in. No. 1639, the last of the simple engines, had

* It should be explained that such workings refer to the period before the war, and take no account of subsequent curtailments of train services.



NO. 1783, CLASS O. STANDARD PASSENGER TANK ENGINE, 1894–1901.
Wheels, 5 ft. 1 in. Cylinders, 18 in. by 24 in.

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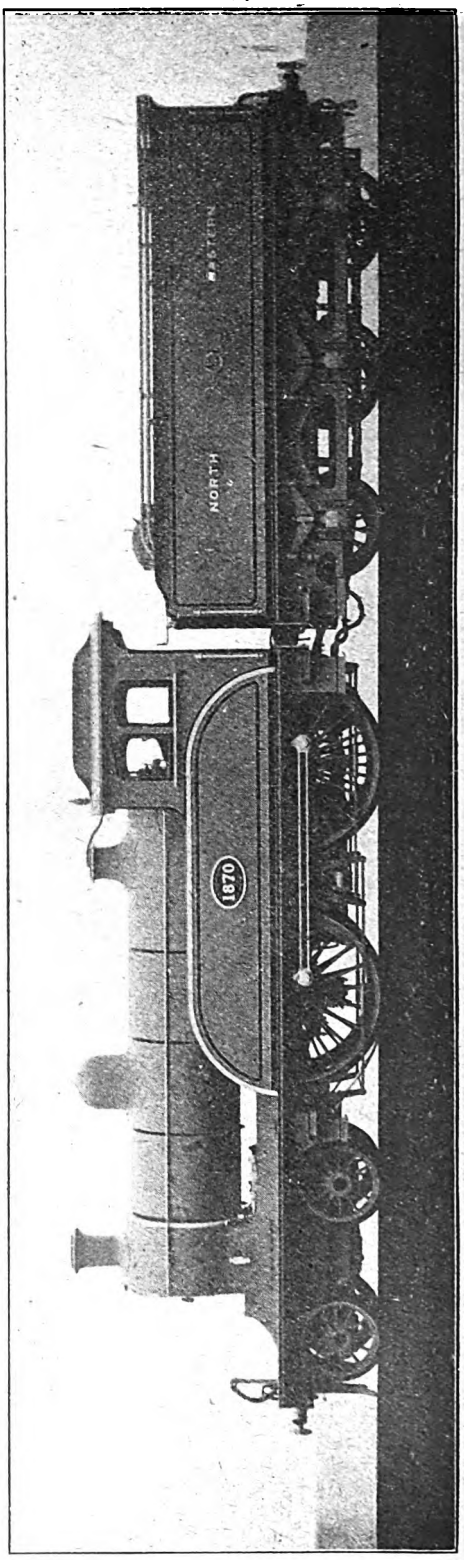
piston valves, the others having slide valves. All of the class had external steam chests somewhat similar to the arrangement on the compound singles of the 1517 class. These engines did excellent work and are amongst the best that have ever run on the North Eastern. Afterwards they were altered to have inside steam chests and piston valves. They were nearly always employed on main line trains, running principally from Newcastle to Edinburgh, York and Leeds, and also on the new fast trains to Carlisle. Some of their performances will be mentioned later. The heating surface was:—Tubes 1,220 sq. ft., firebox 121 sq. ft., total 1,341 sq. ft.

The two-cylinder compound engine No. 1619 (class M1) was stated to have taken regular turns with the class M engines, Nos. 1620 to 1639, and to have averaged 30·38 lbs. of coal per mile as compared with 33·35 lbs. for the simple engines. Nevertheless there must have been some reason for the non-adoption of No. 1619 as a type for further engines, for in 1898 the engine was completely renewed as a three-cylinder compound on Smith's system, and was thus the prototype of the now well-known express engines on the Midland. In her new condition the 7 ft. 1¼ in. coupled wheels were retained, and a single H.P. cylinder was placed centrally inside, having a diameter of 19 in. with a stroke of 26 in. The two outside L.P. cylinders were 20 in. diameter by 24 in. stroke. The heating surface was 1,324 sq. ft., of which 1,171¼ sq. ft. were provided by the tubes and 152¾ sq. ft. by the firebox. The latter was peculiar in having water tubes, the 34⅛ sq. ft. of which are included in the above firebox heating surface. The water tubes were on a principle similar to Drummond's London and South Western Railway system, but were somewhat differently arranged. The boiler pressure was increased to 200 lbs.

Engine No. 1619 thus altered has done very good work; on one occasion it took a train weighing about 265 tons through from Newcastle to Edinburgh at an average speed of 53¾ m.p.h., and on another occasion a load of 340 tons was run through at 51½ m.p.h. Mr. Rous-Marten recorded a run with a light load of 130 tons from Darlington to York, start to stop, in 43¾ min. for the 44¼ miles. My own experience with No. 1619 was on the 6.15 p.m. afternoon Scotch express from York with a heavy load of 9 cars, on which occasion the run from York to Darlington



NO. 1870, BUILT AT GATESHEAD, 1896.
Wheels, 7 ft. 7¼ in. diameter. Cylinders, 20 in. by 26 in.
The two engines of this class (1869 and 1870) have the largest coupled wheels in the British Isles.

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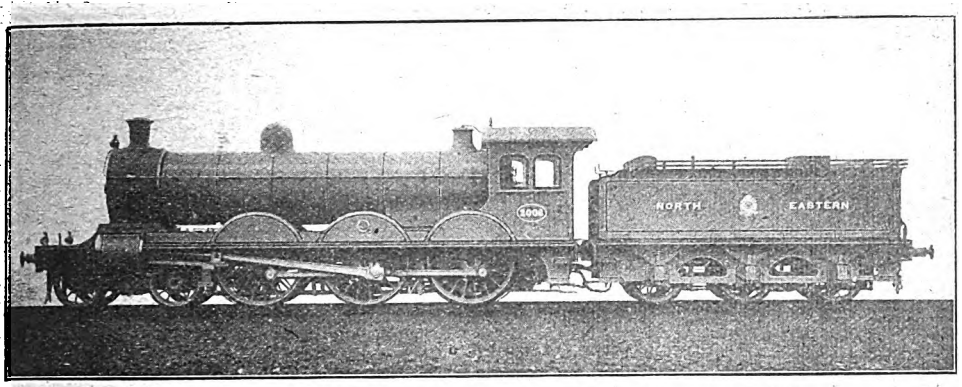

NO. 2006, CLASS S. BUILT AT GATESHEAD, 1899–1900.
Wheels, 6 ft. 1 in. Cylinders, 20 in. by 26 in.
The first 4–6–0 passenger engines constructed in the British Isles.

was performed in the exact booked time of 52 min.

In 1894 Mr. Wilson Worsdell introduced a new type of passenger tank engine for local and branch line trains. These are known as the O class, and in it a return was made to the 0–4–4 type, exclusively used by Mr. Fletcher, but which Mr. T. W. Worsdell had abandoned for the 2–4–2 type. The new engines have side tanks, and are very much after the pattern of the Great Eastern designs in that they have single slide bars with crossheads embracing them. The coupled wheels are 5 ft. 1 in. in diameter and the cylinders 18 in. by 24 in. There are 110 of these engines, all constructed at Darlington between 1894 and 1901, and they were the last four-coupled tank engines to be built for the North Eastern until the recent 3-cylinder 4–4–4 tank engines (2143 class) of 1913–1914 came out. The O class are at work all over the system, and have taken the places of Mr. Fletcher's smaller 0–4–4 tank engines. Many of the latter have since 1899 been converted into six wheels coupled shunting engines, though a number are still at work as steam autocar engines. The O class work many of the long branch line services, such as the coast road from Scarborough to Saltburn—45¾ miles. They displaced the Fletcher bogie tanks on the Ilkley branch and the Harrogate and Bradford service as long ago as 1896. The first lot built in 1894 were put to work on the Newcastle, Annfield Plain and Blackhill branch.

The second race to Scotland, which took place in August, 1895, may now be mentioned. It differed from the 1888 race in that the night and not the day expresses were concerned, and had for its objective Aberdeen, though the East Coast route passes through Edinburgh. On this occasion the North Eastern portion north of York was run by the 7 ft. 7 in. singles, 1517 or J class, by this time converted to simple engines, and the coupled engines of the 1620 or M class. Moreover, the East Coast people found that the West Coast was not working to time-table, for the train left Euston to get to Aberdeen as soon as it could, certainly before the East Coast rivals if possible. Therefore from the middle of August the East Coast companies were also compelled to divide their train into two portions, of which the first also ran without the help of a time-table, whilst the second, although run at very high speed, tried to consider the picking up of passengers *en route*.

The following run from York was performed by engine No. 1522, one of the 7 ft. 7 in. singles. Thirsk (22 miles) was passed in 22 min. 58 sec., Darlington (44 miles) in 42 min. 54 sec., after which a little time was lost owing to a bridge being under repair. Nevertheless, Durham (66¼ miles) was passed in 64 min. 58 sec., and the train pulled up in Newcastle station (80½ miles) in 79 min. 54 sec. after leaving York. The load was 101 tons, and the time allowed, though the schedule varied almost daily, was 80 min.

The 1620 class coupled engines also covered themselves with glory. Engine No. 1621, with six coaches (100 tons), covered the York–Newcastle section in 78½ min., at an average rate of 61·6 m.p.h., and No. 1620 is stated to have run from Newcastle to Edinburgh with the same load at an average of 66¼ m.p.h., having covered the 124½ miles in 112 min. These high speeds took place

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in the latter part of August, after the loads had been reduced. In the earlier part of the month, with a heavier load of 134 tons, engine No. 1636 made the following run :—

Newcastle	.. dep.	1. 1.37	
Morpeth	.. pass	1.22.40	
Alnmouth	.. ,,	1.41.53	
Belford	.. ,,	1.59.35	
Berwick	.. ,,	2.15.16	10 m.p.h.
Grant's House	,,	2.38. 7	
Dunbar	.. ,,	2.50. 0	
Edinburgh	.. arr.	3.20.58	

The late Mr. Rous Marten recorded maximum speeds of 85·7 m.p.h. with both the 1517 and the 1620 classes.

In 1896 some particularly interesting trials of several of the foregoing classes of locomotives were undertaken between Newcastle and Tweedmouth, 65½ miles. The same train of coaches, weighing 186½ tons, was used throughout. The trials were described fully (and those who are interested should consult Mr. Walter M. Smith's paper on the subject) in the Proc. Inst. Mech. Engineers, 1898, which gives diagrams, dynamometer records, etc. The following few figures taken from that paper are those which will be of interest to the readers of the RAILWAY MAGAZINE, as they show what express locomotives of various classes actually accomplish. I should add that the Fletcher 7 ft. engine (901 class) had been rebuilt, and the new boiler was considerably smaller than the original Fletcher boiler, so that it is quite possible that this engine in its original form would have given better results, for the heating surface had been reduced by about 104 sq. ft. The same criticism applies to the Tennant or 1463 class engine which, with a new boiler, had had its heating surface reduced from 1,215 to 1,136 sq. ft., though in this class the pressure had been increased from the original 140 lbs. to 160 lbs. The single express engine (1517 class) suffered in comparison with the others in that the weather was exceedingly bad, with a severe gale on the day when the trials were run by it. The booked time allowance for the run was 75 min.

In 1896–7 there were built at Gateshead 32 more 4–4–0 engines, classes Q and Q1, of which the two engines, Nos. 1869 and 1870, of class Q1, have the largest coupled wheels in the country—7 ft. 7¼ in. diameter. The cylinders are 20 in. by 26 in., and the cabs have clerestory roofs. The 30 engines of the Q class were of similar design, with 7 ft. 1¼ in. wheels and 19½ in. by 26 in. cylinders. The heating surface of all these engines was only 1,216 sq. ft., of which the firebox supplied 127 sq. ft. They carried 175 lbs. boiler pressure. The valves are on the top of the cylinders and driven by rocking shafts and link motion. These engines are Nos. 1871 to 1880, 1901 to 1910, and 1921 to 1930.

The two 7 ft. 7 in. engines were frequently employed on the Newcastle–Sheffield express, which had the remarkable booked timing of 43 min. from Darlington (start) to York, 44¼ miles. This—61·7 m.p.h.—was the fastest booked speed in the country, and the load

	a	*c*	*b*	*d*	*c*
Engine	902	1475	1517 class	1635	1869
Type	2–4–0	2–4–0	4–2–2	4–4–0	4–4–0
Cylinders	18½″ × 24″	18″ × 24″	19″ × 24″	19″ × 26″	20″ × 26″
Driving wheels	6′ 11½″	6′ 11″	7′ 7½″	7′ 0 9/16″	7′ 7½″
Boiler pressure lbs.	140	160	175	175	175
Heating surface—Tubes.. sq. ft.	999·7	1,026·2	1,016	1,220	1,089
,, Firebox ,,	104	110·0	123	121	127
,, Total ,,	1,103·7	1,136·2	1,139	1,341	1,216
Grate area ,,	15·0	17·0	20·7	19·6	20·7
Time lost by engine from N. to T.	3 m. 55 s.	5 m. 8 s.	2 m. 20 s.	—	2 m. 45 s.
Time gained from N. to T.	—	—	—	0 m. 24 s.	—
Time lost from T. to N.	8 m. 15 s.	8 m. 32 s.	—	—	—
Time gained from T. to N.	—	—	2 m. 14 s.	0 m. 6 s.	0 m. 8 s.
Weather conditions	fair to m'd'r'te	fine	severe gale	fine	fine
Coal used on double journey lbs.	5,530	5,170	5,678	4,882	4,890
Water ,, ,, ,, ,,	36,210	41,350	45,255	37,617	41,355
Coal used per mile ,,	42·21	39·46	43·35	37·26	37·33
Water evaporated per lb. coal	6·54	7·99	7·97	7·70	8·45
Average I.H.P. for double journey	560·35	606·5	729·2	645·9	643·3
Coal per I.H.P. lbs.	3·65	3·11	3·11	3·03	2·92
Weight of engine tons	39·5	42·1	46·95	50·7	50·8
Mean weight of tender, double journey ,,	25·345	26·309	32·478	34·81	33·394

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was usually in the neighbourhood of 200 tons. One of these engines ran from Berwick to Newcastle, 66¾ miles, in 80 min., with a load of 230 tons.

The 7 ft. engines—Q class—never appeared to me to be so good as the 1620 or M1 class. Possibly they were over-cylindered for their comparatively small boilers, which were smaller than those of the 1620 class. Nevertheless, they had some good performances to their credit, such as York to Newcastle with 245 tons in 92¾ min., Darlington to York with 230 tons in 48 min. 43 sec., and Newcastle to Berwick in 74 min. 6 sec. with 291½ tons. This last run was one of the best they undoubtedly accomplished. One of the same class—engine No. 1904—holds what, I believe, must be the record between York and Scarborough, viz., the run with a special express of 137 tons with which the 42 miles were covered in 41 min. This is better than it looks, for several miles over the curves near Malton have to be covered at reduced speed.

In 1897 the North Eastern had a locomotive quarrel with the North British Railway, which was probably a small gold mine for the lawyers. From time immemorial the former company had run the East Coast expresses through to Edinburgh, the last 57½ miles of line from Berwick being the property of the latter company. The North British suddenly bethought themselves that they would work these trains themselves, and the North Eastern objected on the grounds that they possessed statutory running powers. They also objected on the additional ground that unnecessary delay would occur in changing engines at Berwick and in making a special stop with those expresses which performed the through run between Newcastle and Edinburgh without a halt. This latter objection appears to have been a valid and sensible one, but the running power question does not seem to have the same weight, unless the North Eastern felt it incumbent upon them to do for the North British what other companies were doing for the North Eastern at the other extremity of its system. For south of York five "foreign" railways are working into that city and to Hull from Leeds, Knottingley, Normanton, and Doncaster, and performing a very large proportion of what is in reality North Eastern train mileage with the "foreign" engines, probably to the entire satisfaction of the owning company, or the practice would not be continued. Consequently, it would seem that since the North Eastern took such great pleasure in seeing other companies' locomotives on so many trains on its own lines, the York authorities considered that the North British ought to have been duly grateful for a similar helping hand on the latter company's line between Berwick and Edinburgh. Therefore the uncompromising attitude of the North British in actually wishing to run its own locomotives over its own line was quite incomprehensible and an uncalled-for liberty. For a time the North British refused to allow the North Eastern engines over their line, so that all trains had to make a special stop at Berwick to change engines. After the lawyers had had a long innings, a *modus vivendi* was arranged, whereby certain through expresses were worked as previously by the North Eastern.

In 1898 the North Eastern seemed to wake up to the fact that some of their principal branches were of sufficient importance to deserve a better and faster service of trains. Chief amongst these was the Scarborough line, which in 1896 had 14 expresses in each direction, with a quickest timing of 60 min. for the 42 miles. In 1898 the number was increased to 16 fast trains in each direction, and the very smart fastest run of 50 min. Even certain trains, which put in the Malton stop, had to cover the entire distance in 55 min. The running average of 50·2 m.p.h. for the fast trains was much the best ever known over this road. The engines employed were the excellent 7 ft. coupled "Tennants." A service between Edinburgh, Newcastle and Sheffield was also started, which in 1898 did the Darlington–York run in 51 min. This train was in later years accelerated to give the remarkable 43-min. run between these two stations (44¼ miles).

But, *mirabile dictu*, they also turned their attention to the Newcastle and Carlisle road, and in connection with the Glasgow and South Western ran through night boat expresses between Newcastle and Stanraer, which covered the 60⅛ miles between Newcastle and Carlisle in 90 min. Moreover, in order to "take it out of" their North British friends in retaliation for the Berwick–Edinburgh litigation they entered into an (to the North British Railway) unholy alliance with the Caledonian Railway for Newcastle–Glasgow traffic, and through coaches were run by the 2.0 p.m. London diner from Glasgow (Central) for Newcastle which were detached at Carlisle. This was the fastest train, though the complete

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service consisted of two through coaches daily in each direction.

There were two other types of express engine which came out before the end of the 19th century, of which the S class (2001–2010) was the first 4-6-0 express type to be built for a British railway (I do not include the Highland 103 class, which were built as goods engines). The 2001 class has 6 ft. 1 in. wheels and 20 in. by 26 in. outside cylinders, and is now one of the standard types of the North Eastern. The other—also a standard class—is the celebrated and excellent R or 2011 class of 4-4-0 express engines with 6 ft. 10 in. coupled wheels and 19 in. by 26 in. cylinders, piston valves, and direct motion. Both types were built at Gateshead in 1899–1900. Very shortly after its first appearance, No. 2011 ran a 320-ton train from Newcastle to Darlington (36¼ miles) in 43 min. 9 sec., and thence took it on to York (44¼ miles) in 46 min. 44 sec. platform to platform. Most of the performances of the R class belong, however, to the present century, so that with this very brief account of them I will bring my North Eastern story to a close with the mention of what might be termed a "ghost" engine shed.

About twelve years ago, in course of my railway wanderings, I found myself "Somewhere on the North-East Coast," in a locality which need not be specified more exactly. Here I dropped across an old friend, one of the higher officials of the North Eastern, who said he was going up that afternoon to a certain place on business and kindly added that if I liked to accompany him he could show me something that would be of special interest to me. We arrived at our destination as the shadows of a gloomy autumn day were beginning to fall, and to the accompaniment of a fierce north-east gale blowing from the sea, which lifted the spray in clouds over the cliffs of an iron-bound coast. My friend having the company's affairs to attend to, pointed out my direction and left me to my own devices. After proceeding for a short distance, always within sound of the surf beating upon the rocks, I came across a lonely spot, a half-hidden recess in the hillside, in which there stood a fairly large engine shed containing some thirty engines. They stood inside the shed in tidy rows, silent and deserted, for not a sound could be heard except the roaring of the gale outside. The engines were the "ghosts" of a North Eastern past, mostly old goods engines of the earlier Fletcher era, including many of the old E. B. Wilson and Stephenson engines of 1852 to 1865. A good many were old acquaintances of my early days, when I used to see them regularly at work in the Leeds, York and Hull districts—engines which I had missed from their quondam haunts some years before. Others were old Stockton and Darlington engines, which twenty to thirty years previously might have been seen panting up the heights of Stainmoor. But their day was now completely past; all of them had brought home the last trains they ever were to run, and they were now waiting in this cheerless and lonely spot, many miles away from any locomotive works, until such time as could be conveniently appointed for the executioner's "set" and sledge-hammer to break them up. "Ghost" sheds occasionally exist as outbuildings of the large locomotive works, but rarely will one be found amid such deserted, bleak surroundings as the one "somewhere on the north-east coast." It may still be there with a fresh company of "ghosts," but I have not seen it since.

In the June "Railway Magazine" Mr. E. L. Ahrons will continue his popular series of articles on "Locomotive and Train Working in the latter part of the 19th Century," by dealing with the South Eastern Railway so far as it concerns his subject.

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Railway Travel in Australia.

By CAPT. SIR ROBERT J. WALKER, Bart., M.A.

AS the big liner comes slowly alongside the wharf at Freemantle, thoughts naturally arise concerning the great Trans-continental railway now in course of construction across Australia.

It is a long way from Nannine, in Western Australia, to Longreach in Queensland, especially as the traveller by rail will have to journey *viâ* the South of the Island Continent, but it will not be long before it will be possible to cover the whole distance by rail. It is true that there will be no less than three breaks of gauge on the way, and it seems that the time has now passed for the Commonwealth to procure a standard gauge throughout. The expense of alteration would be greater than could be borne by the population, prosperous though the several states undoubtedly are. Despite this drawback, and it must be admitted that so many breaks of gauge must constitute a considerable hindrance, the completion of the Trans-continental railway will mark an epoch in the history of Australia, and must prove of inestimable value. At present, Western Australia is isolated from the other States, except by the sea route, and this is a somewhat serious handicap for the travelling public, especially when it is remembered that the Great Australian Bight has for Australians the same evil reputation as the Bay of Biscay has for us in England.

The opening of the new railway will alter all this, and should result in a great increase in the number of visitors to the Western State. Mail transit *viâ* Suez will be expedited by at least two days, and it will be possible to run a daily Inter-state mail service, instead of only once or twice a week as at present. Strategically, too, should the necessity ever arise, the railway will prove its value, and the Commonwealth Government is wise in its determination to possess good internal communications.

But it is not of the Trans-continental railway that I am writing, but rather my idea is to give a short general description of railway practice in Australia. It is not very often that Englishmen who travel abroad are sufficiently interested in matters relating to railways to send any account of their travels home, and it may possibly be that readers of the RAILWAY MAGAZINE may find something of value in the following pages.

Australian railways have followed British railway practice closely in so many particulars that, when travelling, it is sometimes difficult to realise that one is not still in England. Country stations, though they have not the substantial appearance of those at home, bear a general resemblance externally. In the majority of cases they are built of wood, and the accommodation, though not lavish, is no doubt sufficient for the needs of the population. Platforms, name-boards, signal cabins and signals follow British practice consistently. Track differs in one great respect, however, in as much as the rails are spiked down to the sleepers, and therefore "chairs" are not required; but there is nothing in this which is very unusual in railway practice, for I believe Great Britain is the only country in the world where the use of the "chair" is practically universal. Railway officers who have had experience with both systems claim that in many ways the use of spikes is to be preferred, for it is an easier matter to keep a perfect track, and the difference in the smoothness of the running is not so great as might be imagined. At any rate I must admit I could find little to complain about with regard to this latter point, and the running on the main lines at fast speeds compared very favourably with that on English main lines.

Gates at level-crossings are conspicuous by their absence. In order to prevent horses and cattle from straying on the line, cattle-gratings are provided at all level-crossings, and these answer their purpose excellently. On each approach to a level-crossing, large sign-posts are provided with the word "STOP" painted on them, and underneath the words "Look out for the Engine." All locomotives are provided with extra loud whistles, which can be heard at a great distance, and on most of the main lines there are small white boards placed a few

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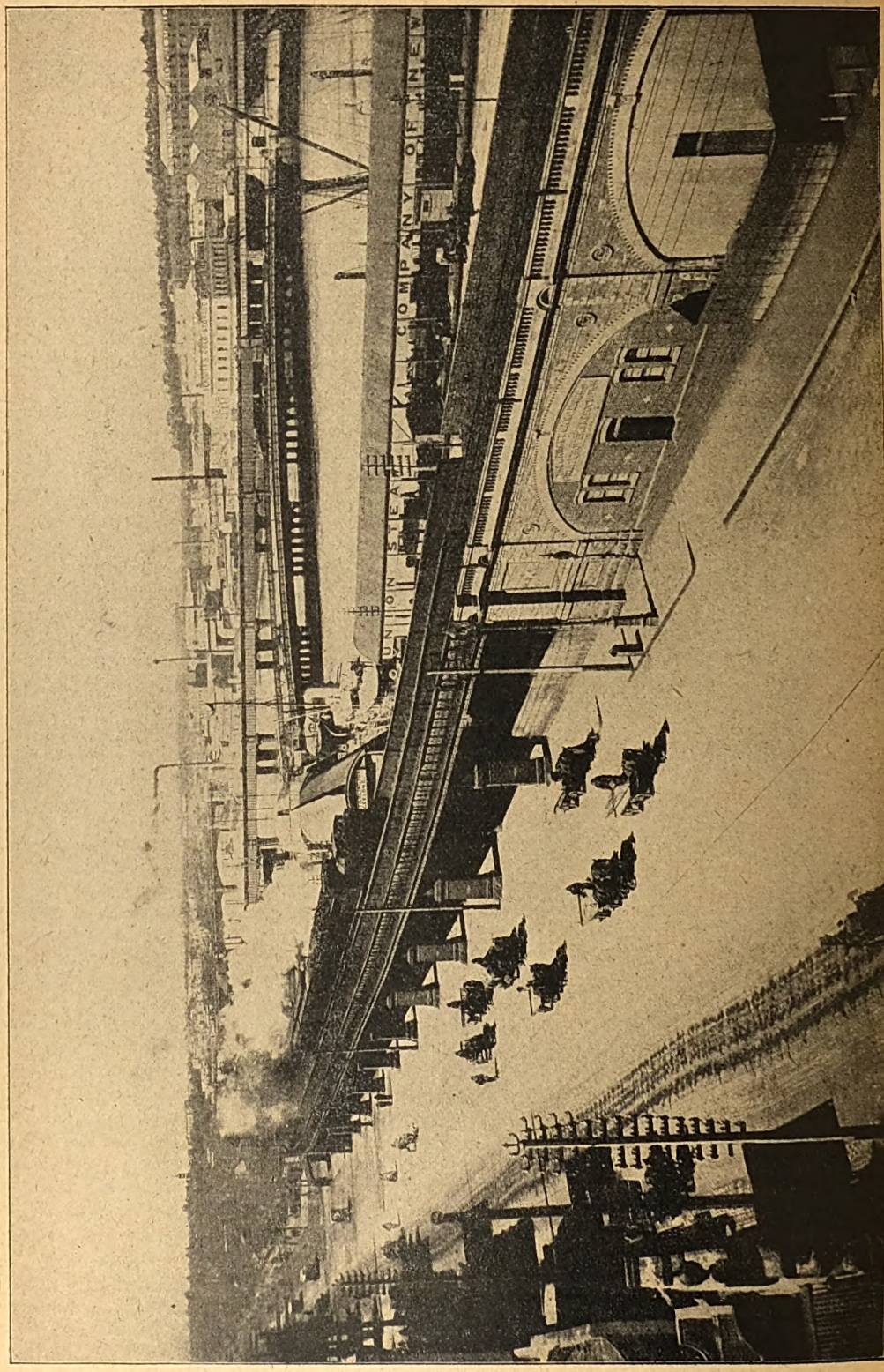

VIADUCT BETWEEN FLINDERS STREET AND SPENCER STREET STATIONS, MELBOURNE.
Queen's Bridge (vehicles), Falls Bridge (railway), Princes Bridge (vehicles).

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hundred yards away from each level-crossing, which serve to remind the driver that he is approaching a level-crossing. However, accidents at level-crossings are, I believe, pretty frequent, especially since the advent of motor cars. If one might venture to offer a suggestion, I believe it might tend towards greater safety if the warning boards were placed rather further away from the crossing. In the majority of cases, the motorist comes up to the warning board and the level-crossing at the same moment. Most of the locomotives are provided with cow-catchers, and many minor accidents are prevented by their use.

Locomotives and rolling-stock also closely resemble those in use at home, although both are modified to suit the conditions peculiar to the country. For example, the majority of the locomotives show what one might term a combination of British and American ideas in their construction. British in general appearance, because they have been designed and constructed by locomotive engineers who have received their training at home; and American, because these same engineers have found it desirable to adopt certain expedients to suit conditions in Australia, conditions which are in some respects, very similar to those existing in America.

With regard to the passenger rolling-stock, it may be said that both British and American practice is followed. There is the ordinary compartment car, with or without the corridor, and there is the open or semi-open car. The latter type of vehicle is principally in use on suburban trains. There are only two classes for passengers—first and second—and whilst it may be said at once (and I hope without giving offence) that the "ordinary" first-class is not quite up to the English standard, it must always be remembered that the population is small, and that the fares are cheap.

I say "ordinary" first-class, because on certain express trains, such as those between Adelaide and Melbourne, and Melbourne and Sydney, the first-class accommodation is excellent, and could hardly be bettered anywhere in the world. It is as good, if not better, than the "de luxe" expresses run in Europe by the *Campagnie Internationale des Wagons Lits*. Sleeping cars are extremely comfortable, and are built on the English principle, in two-berth compartments, with side corridor.

Owing to the severe gradients met with on some portions of the Inter-State main lines, dining cars are not invariably attached to the trains, but stops of about half an hour are made at way-side stations, where an excellent hot meal may be partaken of at an exceedingly moderate price. These station dining-rooms are not owned by the Railway Departments, but are leased to contractors, under the general supervision of the Department. In goods vehicles, we see both types in use, the small four-wheeled goods wagon so familiar at home, and the long covered bogie freight van equally well known in the States. A noticeable goods vehicle is the special sheep truck, with two decks, so that double the number of sheep can be conveyed in one truck. Where large numbers of sheep have to be carried, this arrangement seems an admirable one.

Through the courtesy of Mr. E. G. Lucy, Chief Mechanical Engineer of the New South Wales Government Railways, I was able to pay a visit to the Eveleigh Locomotive and Carriage Works. Mr. Lucy, who by the way spent many years with the Great Western Railway at Swindon before taking up his present important post, gave me much interesting information concerning the New South Wales Railways. He has also kindly supplied me with the photographs and plans reproduced in this article, so far as they concern his railway.

"You have some pretty severe gradients to compete against in New South Wales," I suggested. "Yes," replied Mr. Lucy, "they are truly terrible, but we are doing our best to modify the worst of them, and already a good deal has been done in this direction."

"From what I've seen, there is a great deal to do yet, before your locomotives will get even a fair chance." "That is so," said Mr. Lucy, "let us just run through the three main lines from Sydney. The Southern line to Albury, which is the New South Wales portion of the Sydney-Melbourne route, is a very trying line to run, there being a long piece of 1 in 30 to Hill Top, now being regraded. The rest of this line may be fairly described as switch-backs of 1 in 40. Exeter, 93 miles from Sydney is 2,352 ft. above sea level, whilst at Yass, 189 miles, the height is only 1,660 ft."

"The Northern line to Wallangana, 492 miles, is only fairly level for 12 miles and then it begins by 1 in 40 grades and sharp curves to climb to Hornsby, 21 miles, 594 ft.; then to Kuringgai, 25 miles, 702 ft. From here, there is a sharp fall to the Hawkesbury River, 36 miles from Sydney

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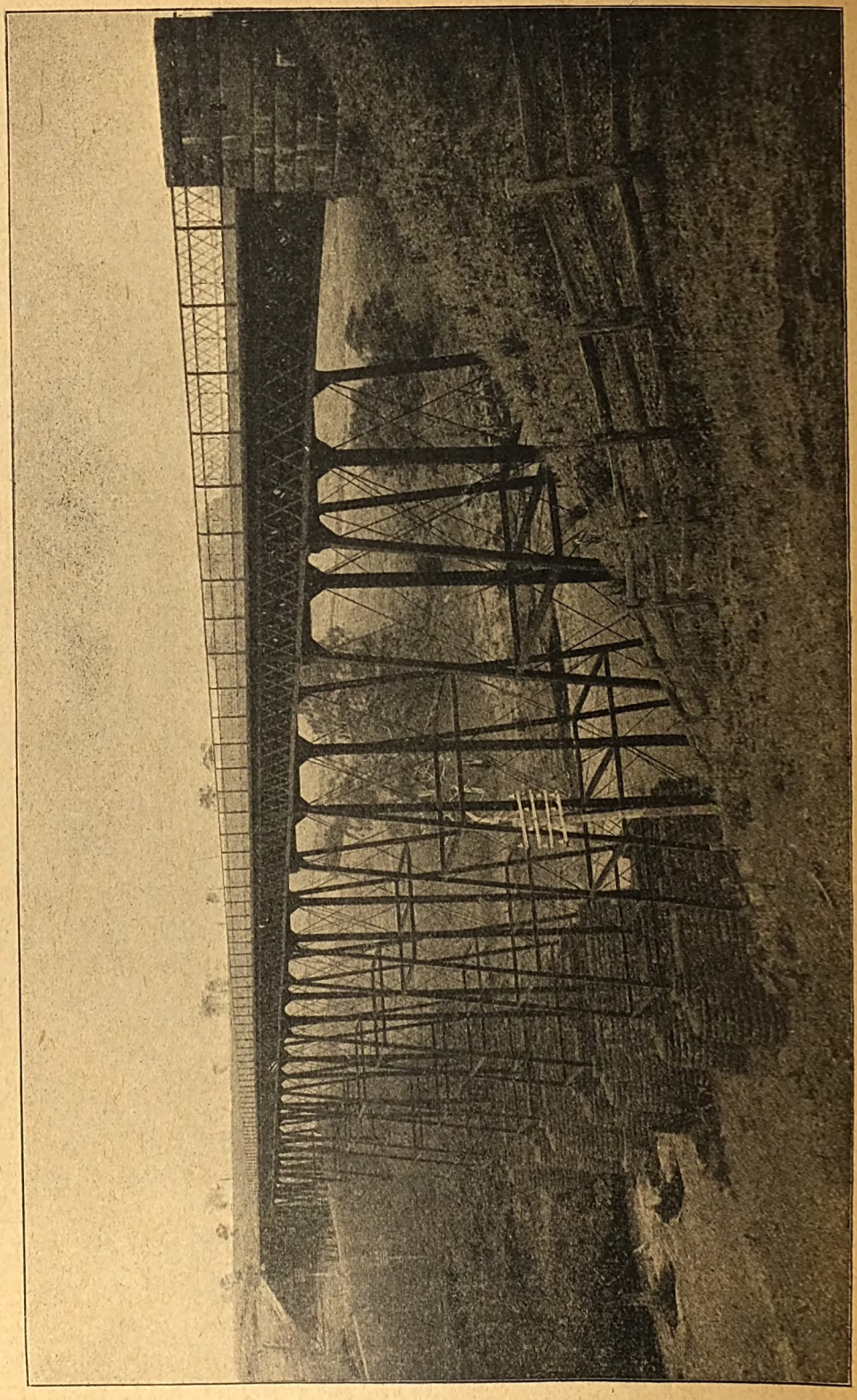

VIADUCT OVER WERRIBEE RIVER, PARWAN: MELBOURNE-ADELAIDE LINE.

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and 11 ft. above sea level. This is also accomplished by grades of 1 in 40 and sharp curves. The Hawkesbury River bridge is our best structure in New South Wales. The remainder of the Northern line is also of the switch-back order, with ruling grades of 1 in 40. Ben Lomond station on this section, is 4,473 ft. above the sea."

"What about the Western Line, and the great climb over the Blue Mountains?" I asked. "That is the worst of the lot," replied Mr. Lucy, "although the trains are naturally not so heavy as they are on the Albury Line. The Western Line is fairly level and permits of high speeds from Sydney, 67 ft., to Emu Plains, 89 ft., and 36 miles from Sydney. Thence to Valley Heights, 1,056 ft., and 45 miles, this section is surmounted by grades of 1 in 60. From Valley Heights to Katoomba, 3,336 ft., and 65 miles from Sydney, the grades are as severe as 1 in 33. The summit of the Blue Mountains railway is reached at Newnes, 3,503 ft., 286 miles distant from Sydney. Once the plains are reached, however, there is nothing to complain about, for from Nyngan, 570 ft., to Bourke, 350 ft., a distance of 126 miles, there is one of the straightest and longest pieces of nearly level track in the world."

"Are you contemplating any changes of general interest in the near future?" I asked. "Well, it may interest you to know," replied Mr. Lucy, "that we are doing away with the double buffer system so common on English railways, and substituting for it the American type of central buffer and coupling combined. This model which I have here, will explain the system, which is extremely simple, and is in general use on the English East Coast route. I am reckoning on making a big saving over this change. The old passenger stock is being fitted with the central buffer as fast as we can deal with it, although we shall have to leave the old buffers on as well, until the change is universal."

"You will no doubt like to have some details of our latest locomotives and rolling stock. The number of locomotives totals 1,182, the latest class being the 'NN' class, which were first built at the Eveleigh Works in 1914. This class can haul behind its tender a maximum load of 300 tons, on a grade of 1 in 40, at 16 miles per hour. On one occasion," continued Mr. Lucy, "I sent one engine through from Sydney to Albury, roughly speaking 400 miles, turned it and sent it back again another 400 miles, with express passenger trains, on 44 lbs. of coal per mile. In the ordinary course of running, we usually change engines at Goulburn and Junee each way. Flaman's speed recorder shows that on occasions the engines of the 'NN' class travel at 69 miles per hour." Principal dimensions of this class are:

Outside cylinders	..	22½ in. dia. by 26 in. stroke.		
Heating surface—Firebox	..	..	165 sq. ft.	
,, ,, Tubes	..	..	2,040	,,
,, ,, Sup. Elements	..	..	547	,,
Total	..	..	2,752	,,
Grate area	..	..	30½	,,
Tender—Water capacity	..	..	4,000 gals.	
,, Coal ..	..	..	9½ tons.	
			T.	C. Q.
Weight—Empty	.. Total	..	91	18 2
,, In steam	.. ,,	..	124	14 0

"The T/F class, which were brought out in 1912, can haul 345 tons on 1 in 40 at 10 miles an hour."

"Concerning passenger rolling-stock. The New South Wales railways have 2,031 passenger cars in use, the longest being the new 'sleepers,' which are 72 ft. 6 in. in length and 45 tons tare. These sleeping cars consist of two classes, the T.A.M. and the C.A.M. sleeper, and one of each is attached to each Northern and Southern Limited Express, the seating capacity in the C.A.M. sleeper being kept for the convenience of the sleeping passengers only before or after they please to turn in. All these vehicles are electrically lighted, and the T.A.M. class has sleeping berths for 20 passengers or seating accommodation for 30, whilst the C.A.M. class has sleeping berths for 10, and seating accommodation for an additional 30 passengers."

"Of goods vehicles, there are 21,449 in use, the longest being 40 ft. and equal to a load of 40 tons. For special work we possess five well wagons of 40 tons capacity, capable of dealing with big gun work. There are also some hundreds of the 40-ton flat steel wagons with removable bolsters, so designed to permit swift end or side loading of field guns, with a system of ramps from wagon to wagon, permitting a whole battery to be loaded up in a few minutes. This is not in theory only, but has been tested in practice. There are also vehicles in existence for swift fitting of a commissariat and cooks' train, which will provide 2,000 meals every four hours and is self-contained. For ambulance purposes we possess berths, etc., ready to put into the American type carriages."

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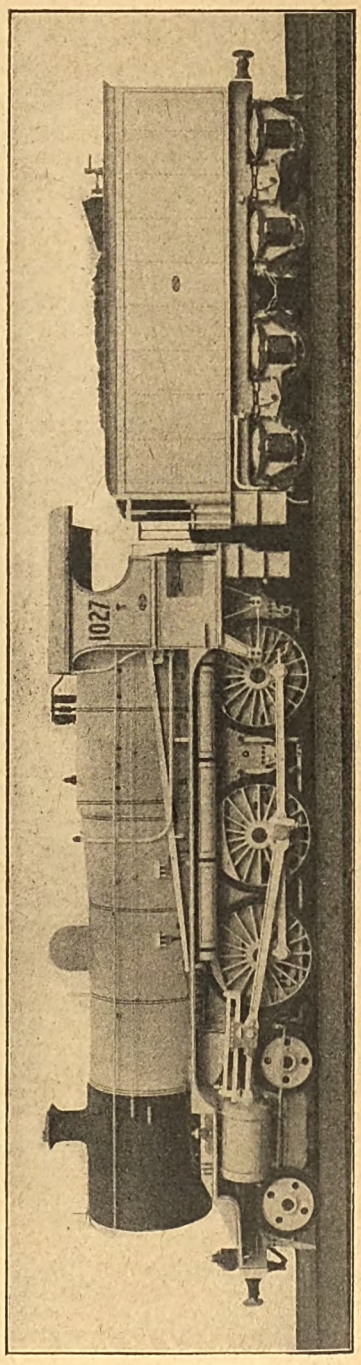

4–6–0 SUPERHEATER LOCOMOTIVE, CLASS NN: NEW SOUTH WALES GOVERNMENT RAILWAYS.

After taking my leave of Mr. Lucy, I was conducted on a rapid tour of the works. Here I saw one of the latest of the big "NN" class of locomotive, ready for her trials. As will be seen from the photograph, these are fine engines, as indeed they must be, if they are to deal satisfactorily with the very severe grades.

In the Eveleigh Works are to be seen all the various departments which are necessary for the turning out and repairing of the locomotives and rolling stock of a great railway. The shops are large, airy and light, and some have been built within the last year or two. If one can find any fault, they are perhaps rather cramped for room, as all the land adjoining has long since been built over and there is little room for the expansion which a railway of the ever-growing type of the New South Wales Government system must necessarily require. The carriage shops are situated quite close to the locomotive shops. There was not very much new work in hand, except some useful long horse boxes, to carry six horses, and some exceptionally fine mail-vans. These latter vehicles are rather a feature of Australian rolling stock construction, for it must be remembered that His Majesty's Mail is usually a very heavy one, especially in the case of that from Europe, which arrives only once a week and has to be despatched from Adelaide to Melbourne and Sydney by one or two trains only.

The Inter-State journey from Adelaide to Sydney is full of interest, and gives one an excellent idea of Australian railway working, although the greater portion of the journey takes place by night. However, in the middle of the Australian summer it is possible to see a good deal in daylight.

Until a few years ago, the big mail-steamers from England had to anchor well out in Larg Bay, and mails and passengers from Adelaide were landed in a tender. Now, however, Port Adelaide has been constructed, and it is possible for the mail-steamers to go alongside the wharf, thus saving a great deal of time and labour. The Inter-State Mail Express still departs from Adelaide itself, the mail-vans being worked to Adelaide from the port as a special. Passengers take one of the numerous local trains from the wharf station, and a journey of some forty minutes brings them to the pleasant Capital of South Australia. The mail-steamer usually reaches port in the early morning, and the traveller has plenty

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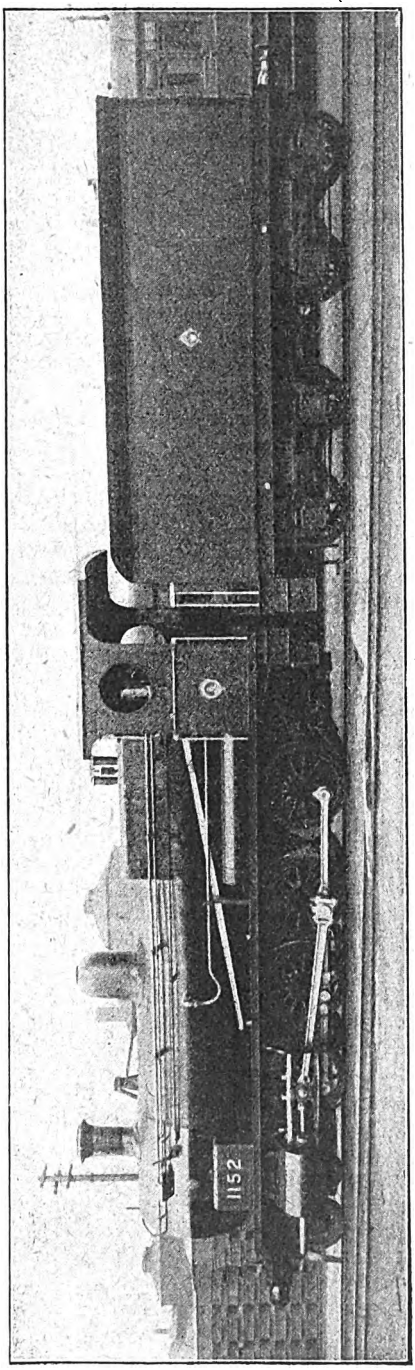
of time to take a look at Adelaide, as the Express for Melbourne does not depart until 4.30 p.m. It might here be mentioned that the State Railways grant tickets to passengers from the mail-ships at reduced fares, upon the production of a certificate signed by the ship's purser. With this concession, the first-class fare from Adelaide to Sydney works out at the low figure of £3 14s., to which, however, must be added the extra charge for sleeping berths at 10s. a night.

Punctually at 4.30 p.m. the Melbourne Express gets away, the train being an extra heavy one on account of the English mail which travels by it. After a few miles of level country, during which we pass through the suburbs of Adelaide, the ascent of the Mount Lofty range commences, and some very stiff grades have to be overcome. Those who have imagined Australia as a flat open country, will be speedily disillusioned, nearly all the main lines having sections which equal or exceed the Highland Railway for difficulty. Speed slackens down to about 15 miles an hour, in spite of the fact that the train is double-headed. The ruling gradient proves to be as severe as 1 in 44, and the load is a heavy one. Twenty-three miles are covered in the hour, but once the summit of the range is passed speed increases rapidly, and some quite good running takes place over the rolling plains which extend on each side of the River Murray. Murray Bridge is reached at 7.9 p.m., and here a stop of 25 min. is made for dinner. An excellent hot meal is provided in the refreshment room for the moderate charge of two shillings. Immediately on leaving the station, the Murray River, is crossed by a fine bridge, but it is now getting too dark to see anything of the country. At Serviceton, which is reached at 11.30 p.m., and which is 196¼ miles from Adelaide, the Victorian Railways take over the train, and are responsible for the working of the remaining 287 miles to Melbourne. The South Australian timing works out at 27·83 m.p.h. including all stops.

The country now continues practically level for the next 130 miles, when the Mount Ararat range is reached. There is, however, nothing very desperate to be overcome, the stretch of 10 miles from Great Western to 1½ miles north of Ararat working out at an approximately average grade of 1 in 175. Shortly after this, there is a steeper bank for the 5 miles from Dobie, this being at an average of 1 in 90. Between Middle Creek and Branfort there is another sharp climb



2–8–0 GOODS LOCOMOTIVE, CLASS 7F: NEW SOUTH WALES GOVERNMENT RAILWAYS.

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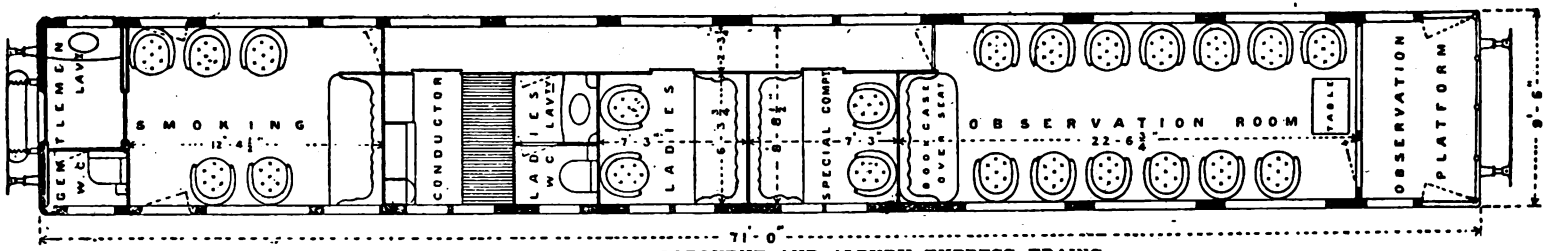
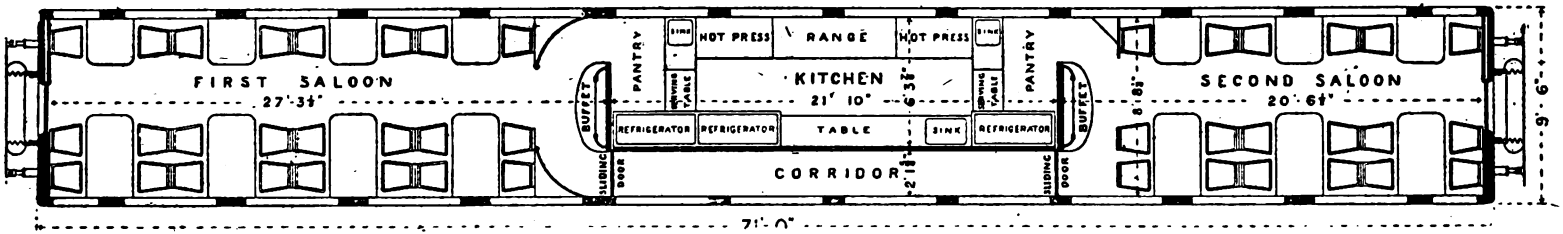
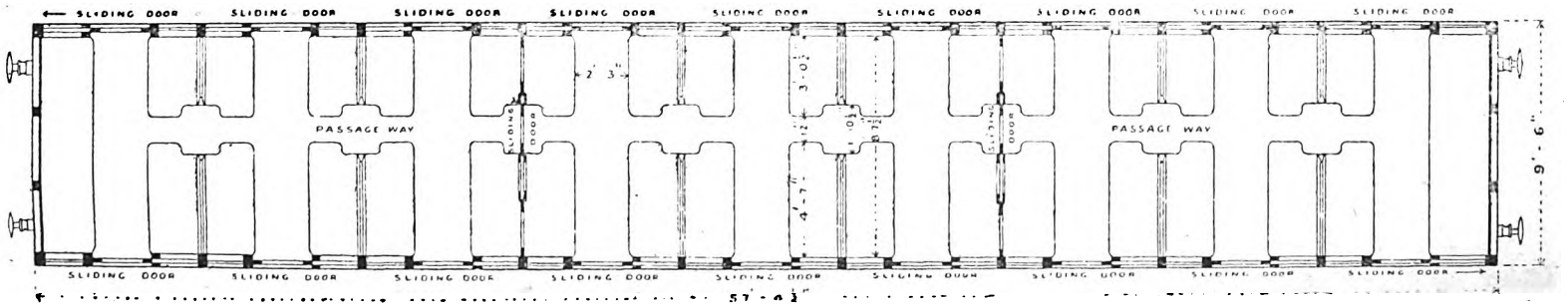


PARLOR CAR FOR MELBOURNE AND ALBURY EXPRESS TRAINS.
Seating Capacity, 33 Passengers.



DINING CAR, SYDNEY-ADELAIDE EXPRESS.
Seating Capacity: First Saloon, 24 Passengers; Second Saloon, 18 Passengers.



"TAIT" SUBURBAN CAR, SECOND CLASS; VICTORIAN RAILWAYS.
Seating Capacity, 92 Passengers.

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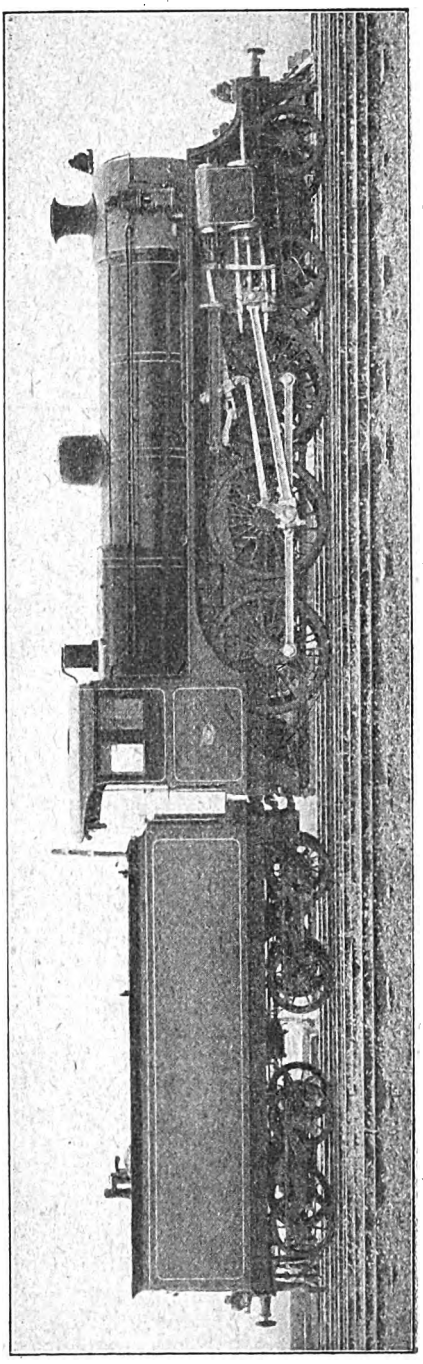
of 2½ miles, mostly at 1 in 50, followed by an almost equally sharp drop into Beaufort. For the next 28 miles into Ballarat the line is practically level, and some fairly fast running is indulged in. At Ballarat, a halt of 16 min. is made and engines are changed.

Immediately after leaving Ballarat East, another stiff bank has to be climbed, there being a stretch of just under 3 miles at 1 in 52. The line is of the switch-back order all the way to Ingliston, the summit being passed at Wallace, 1,940 ft. Ingliston is 45 miles from Melbourne, and from the former to Bacchus Marsh, a distance of 13¼ miles, there is a drop of 1,170 ft., the greater portion of it being at 1 in 48. Excessive speed is not allowed, however, and 19 min. are allotted for this distance. It would have been more interesting to have made the journey in the opposite direction and to have observed what Mr. Shannon's fine A2 Class can do when faced with a problem of this sort. The remainder of the journey calls for little comment, with the exception of the fine viaduct over the Werribee River, near Parwan. The last 29 miles into Melbourne are on an easy grade, the line falling from 464 ft. to 30 ft. at Spences Street station: 55 min. are allowed for this, Melbourne being reached at 9.59. This section, too, must call for a pretty stiff effort on the return journey.

Mr. Shannon, Chief Mechanical Engineer, has since furnished me with some particulars of his express workings between Melbourne and Adelaide, and they show some creditable figures. It must be remembered that the line is a single one throughout, with the exception of a few miles in the suburban districts of Melbourne, and that speed has to be reduced to 20 m.p.h. when passing the Staff stations intermediate between the stopping places. There are no less than 25 of these Staff stations in addition to eleven stops. The "Melbourne Express" covers the 287 miles from Serviceton to Melbourne in 9 hours 43 min., inclusive of stops and in 8 hours 24 min., stops excluded. These give speeds of 29·54 m.p.h. and 34·16 m.p.h. respectively. The fastest run between stops is that between Horsham and Murtoa, the 18 miles taking exactly half an hour, but on the 13¼ miles between Ingliston and Bacchus Marsh, already noted above, and 10 miles of which are on a down grade of 1 in 48, the average rises to 41·84.

On the down journey, there is an adverse grade averaging out to 1 in 356 and lasting for the 29¼ miles to Parwan. For this bank



4-6-0 SUPERHEATER LOCOMOTIVE: VICTORIAN GOVERNMENT RAILWAYS.

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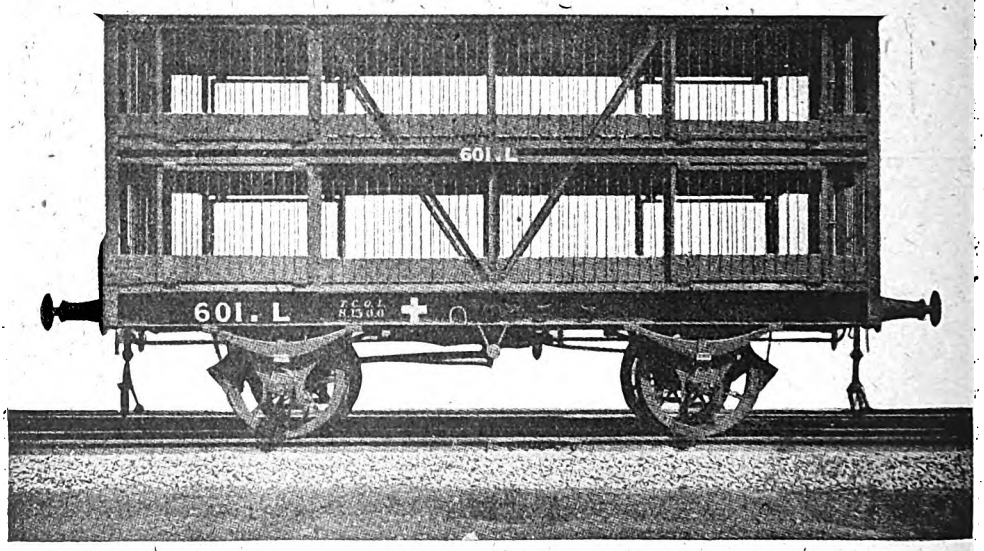
an allowance of 54 min. is given, or equal to exactly 32·5 m.p.h. The average load consists of eight 71 ft. cars and vans, or equal to an approximate tonnage of 328 tons, and in addition there is the single line working to take into consideration.

At Bacchus Marsh, 31¾ miles from Melbourne, an assisting engine is attached as far as Ballan. The distance of 17¾ miles occupies 51 min., the rise being 1,323 ft. The "Down" journey to Serviceton takes 10 hours 30 min., but the actual running time is 9 hours 10 min., or 46 min. longer than on the "Up" journey. Speed works out at 31·31 m.p.h., as against 34·16 m.p.h. in the opposite direction. The "Down" journey is unquestionably the harder of the two, on account of the long climb out of Melbourne, with the exceptionally stiff portion from Bacchus Marsh to Ballan.

The Inter-State traveller has the best part of the day in Melbourne, for the Sydney Express does not leave until 5 p.m. Leaving Melbourne, an observation car, with platform at the end, is attached to the rear end of the train, for seats in which a small supplementary charge is made. From this car an excellent view of the surrounding country can be had.

The first 33¼ miles give Mr. Shannon and his drivers a very big problem, for in this distance there is a rise of 1,115 ft. or equivalent to an average grade of 1 in 153. Yet the time allowed is only 62 min. This gives a speed of 32·17 m.p.h. The greater portion of this section is single line working and there are two intermediate Staff stations where the usual reduction of speed to 20 m.p.h. has to be enforced. The load is normally the same as on the Adelaide Expresses—8 cars and vans, or approximately 328 tons. The ruling grade on this section is 1 in 50 and the longest length of this is 3 miles. From Kilmore Junction to Seymour, a distance of 28 miles, there is a drop of 681 ft., and the speed is accelerated to an average of 44·21 m.p.h. There are, however, several sharp curves in this section, and also one Staff station.

The remainder of the journey to Albury is practically a level one. There are 13 Staff stations in addition to those already mentioned. The total time for the 190½ miles is 5 hours 21 min., or an average speed, including stops, of 35·6 m.p.h. The actual running time allowed is 4 hours 53 min., or almost exactly 39 m.p.h. This must be considered excellent going for single track working, although the grades are easy after passing Kilmore Junction. Only four stops are made, at Seymour, Benalla, Wangaratta and Wodonga. The latter place is only 3½ miles from Albury. At Albury, which is just over the Victorian border, a break of gauge occurs, but only 24 min. are allowed for transferring the passengers, mails and baggage, no small task, especially if it happens to be the English mail night.



10-TON TWO-STOREY SHEEP TRUCK (STEEL): VICTORIAN RAILWAYS.

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Before describing the remainder of the journey to Sydney, it may here be noted that the "Up" journey from Wodonga to Seymour is done at the average actual running speed of 42·3 m.p.h., and there are 13 intermediate Staff stations in addition to the two stops—at Wangratta and Benella. Fifty-one min. are allowed for the climb up to Kilmore Junction (28 miles) and the remainder of the run into Melbourne occupies 47 min. This gives an average running speed of just over 40 m.p.h. The Victorian Railways' coaches afford great comfort, and this is largely accounted for by the wider gauge. The running of the Sydney Express leaves nothing to be desired, and though the speeds do not reach quite the same level as those on English main lines, it must not be forgotten that the grades are in many places severe, and there is always the difficulty of maintaining a high average on a single line.

But to continue our journey to Sydney. The New South Wales officials get the train away punctually to the minute at 10.45 p.m., and so quietly be it noted, that the writer narrowly escaped being left behind. I am almost sure that on the night in question, several travellers had to forego their "sleepers" and follow on in the second Express which leaves Albury 20 min. later. After spending so long in the coaches of the wider gauge, the normal 4 ft. 8½ in. seems somewhat narrow. Apart from this, however, the New South Wales "sleepers" are very comfortable and run as smoothly and quietly as any I have travelled in. The first 100 miles to Junee Junction do not call for much comment, and some good running is done on this section, the speed averaging over 40 m.p.h. After leaving Junee, the work becomes more difficult. It is of the switch-back order all the way to Hill Top, a distance of no less than 223 miles from Junee. The summit of this range is at Exeter, which is 2,352 ft. above sea level.

It is a difficult task to describe adequately the sort of grades which have to be overcome during this immense distance, and a gradient profile of some of the harder sections is the only thing which gives any true idea of the country.

From Hill Top to Menangle, there is a very sharp descent, and the Melbourne Limited does some speeding up, a good rate of speed being maintained for the remainder of the journey to Sydney. The last 40 miles are of the switch-back order, with a ruling grade of 1 in 100.

A stop of 25 min. is made at Moss Vale for breakfast. The total time allowed from Albury is 11 hours 25 min., exclusive of stops, which gives a speed of just over 27 m.p.h.

The Western line already referred to, which takes the traveller over the Blue Mountains, is most interesting. It is, however, so world-famous, that no lengthy description need be attempted here. A considerable amount of regrading and deviation has been carried out since the line was first constructed, and the 5 miles from Emu Plains to Blaxland, which were formerly graded mostly at 1 in 30 and 1 in 33, are now graded at the more moderate figure of 1 in 60. Further on, however, between Valley Heights and Katoomba, a distance of 20 miles, 1 in 33 is the ruling grade, alternating with stretches of 1 in 66.

At the end of the year 1915, the length of the New South Wales system totalled no less than 4,134 miles, and in addition there was a considerable mileage under construction. The longest of these new lines is that which is to connect Condobolin with Broken Hill, a distance of approximately 400 miles. This line, when completed, will afford a second means of communication between New South Wales and South Australia. The next most important line under construction is that which will connect Waucope with Grafton, a distance of some 130 miles. This line will follow the coast, and will be the means of linking up the Grafton-Lismore Section, at present isolated, with the remainder of the New South Wales system. Other long sections of line being constructed are those which will join up Dubbo with Dunedoo and thence to Coonabarraban and Gap, a total length of about 180 miles, a line joining Forbes with Stockinbingal, 70 miles, a branch line from Wagga Wagga to Tumbarumba, 60 miles, and a branch from Wyalong to Cargelligo, another 60 miles.

These new lines, with some other branches of lesser importance, bring the total mileage under construction up to no less than some thousand miles, so that it will be readily realised that the New South Wales Government is determined to develop the country as quickly as possible.

In conclusion I wish to express my gratitude to Mr. Lucy, the Chief Mechanical Engineer of the New South Wales Government Railways, and to Mr. Shannon, who occupies a similar position on the Victorian Railways, for their courtesy in supplying me with much information and for photographs and plans reproduced.

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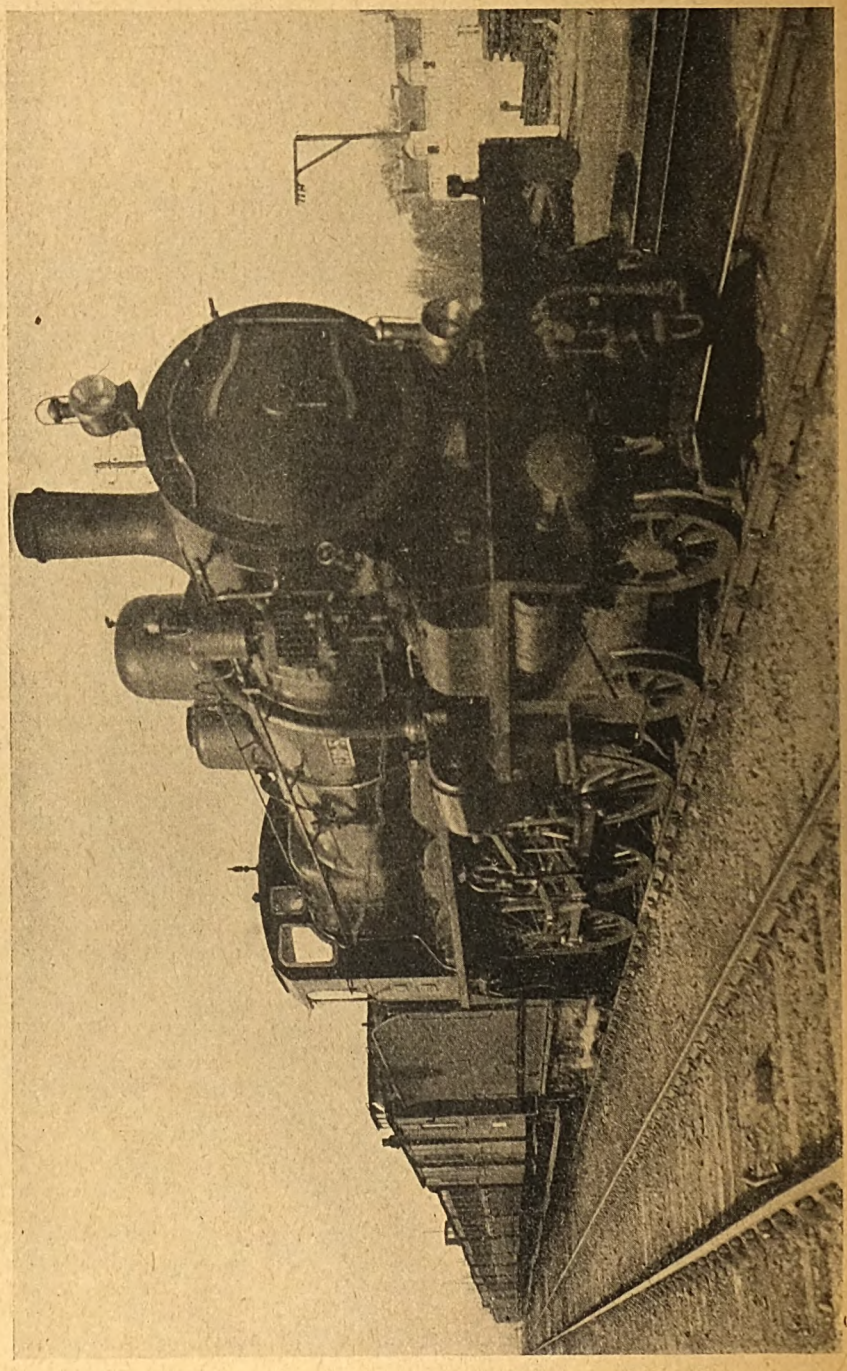
A TYPICAL FRENCH RAILWAY TRAIN.



[*Photo*] OUEST-ETAT 4–6–0 COMPOUND LOCOMOTIVE ON A LOCAL TRAIN AT POISSY. [*W. H. C. Kelland.*

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Lynton and Barnstaple Railway.

By J. F. GAIRNS.

EVEN before there was any suggestion of a railway thereto, the twin resorts of Lynton and Lynmouth were visited very widely by tourists, especially by brake and other trips from Ilfracombe, Barnstaple and other places. Therefore, the proposal for constructing a light railway offered very favourable prospects for traffic, the chief obstacle being the exceptionally hilly country to be traversed, whatever route were adopted, and the considerable heights to which the line must inevitably climb. These difficulties were, indeed, the unavoidable corollary to the exceptional beauty of the country to be traversed and, as a completed undertaking, there can be few lines which, within a length of some 19½ miles, reveal so wonderful display of natural beauty.

LYNTON AND BARNSTAPLE RAILWAY'S TRAIN AT BARNSTAPLE TOWN STATION.

The late Sir George Newnes was the prime mover in the promotion of the Lynton and Barnstaple Railway, and he was the first Chairman of the Company, which was incorporated in 1895, the line being opened throughout on May 16th, 1898. Owing to the engineering difficulties involved it was laid out to a gauge of 1 ft. 11½ in., based upon experience with the Festiniog Railway, which initiated that gauge. Although so narrow, a considerable traffic is dealt with, and seeing how numerous and sharp are the curves involved it is doubtful whether a wider gauge could have been adopted, unless at many times the cost of construction and operation.

At Barnstaple Town station connection is made with the Ilfracombe branch line, over which through coaches are run *viâ* both the London and South Western and the Great Western routes from London. The station is jointly owned between the London and South Western and the Lynton and Barnstaple Railways, but owing to the location has only one through line for standard gauge trains in both directions, with, on the other side of the platform, a bay and running-round line for the narrow gauge trains. Beyond the station is a transhipping bank with sidings for the exchange of goods traffic, which is transferred here to and from the ordinary and narrow gauge trucks.

Leaving the station the Lynton and Barnstaple line curves away sharply, through the industrial portion of Barnstaple, to

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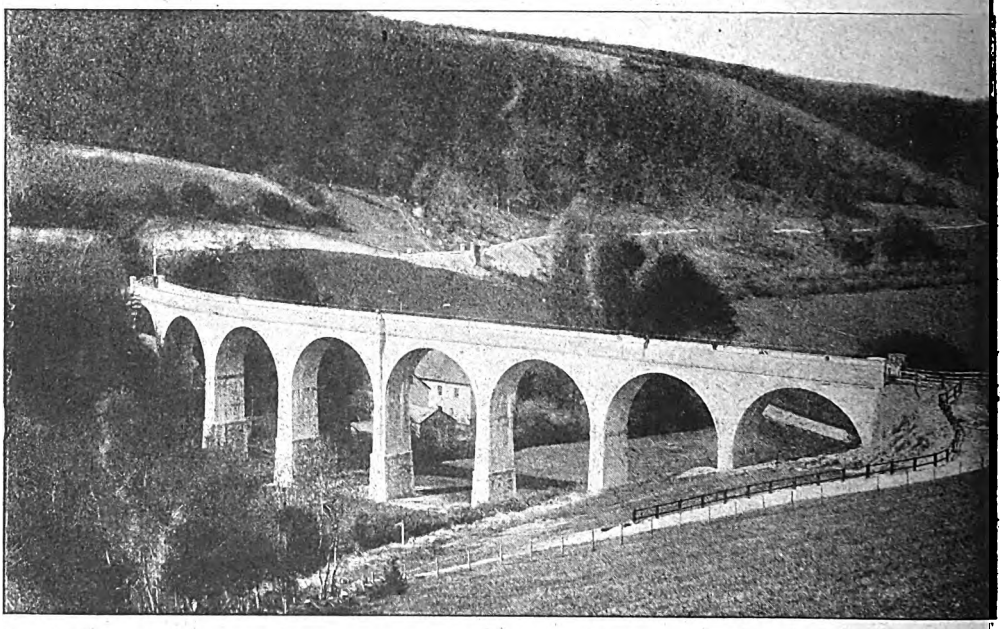
Pilton Bridge, where is the depôt for the line, with small workshops and engine and carriage sheds. Once clear of the town, the line begins its winding course through the Devonshire "Combes," and near Snapper halt the views had are truly magnificent along the valley of the Yeo. By this time the line is well on to the grades of 1 in 50 which characterise its route, and is climbing towards the hills. Approaching Chelfham (4½ miles), a series of sharp curves provide a wonderful sweep round the valley and then over the Chelfham viaduct, where are splendid views along the valley from both sides.

ments carry the line across one valley to another.

At Blackmoor (12 miles) some of the trains detach a few vehicles, particularly those conveying market traffic from Barnstaple, owing to passengers returning from the town alighting to reach the villages served by the line. And if two engines have been used hitherto, one will probably be detached here, as this is the first summit of the line.

Continuing, the route becomes still more magnificent, though it is descending for a short distance before entering again upon the 1 in 50 climb to Woody Bay. A halt at Parracombe is another centre for traffic,



CHELFHAM VIADUCT.

Chelfham is a crossing station, with neat little platforms. Climbing still continues as the line proceeds, now on a ledge cut from the hillside, now on high, and in some cases, awesome embankments spanning a valley, curving in and out, now through a grove of trees, then giving beautiful views between the hills. At Bratton Fleming (8 miles), still ascending, the height of the line renders the views still more impressive, and some of the curves near are so sharp that it is not necessary for the passenger in a third or fourth carriage to lean out of window to see the engine. Indeed, in some cases, even a short train may be on both sections of an S-curve simultaneously. In places embank-

though it is announced, as in the case of Snapper halt, that trains call only by request.

Approaching Woody Bay heather-clad moorland diversifies the hill country, and a passing glimpse may be had of the coast at Woody Bay, a mile or so away. This is the second summit of the line, and hereafter is a run down to Lynton, though at the terminus the line is still some 700 ft. above sea level, so that the heights realised at the two summits will be realised.

On this final stage the line is high up on the hillside, and the views down into the valleys far below and across are most impressive. Near Lynton is a non-advertised

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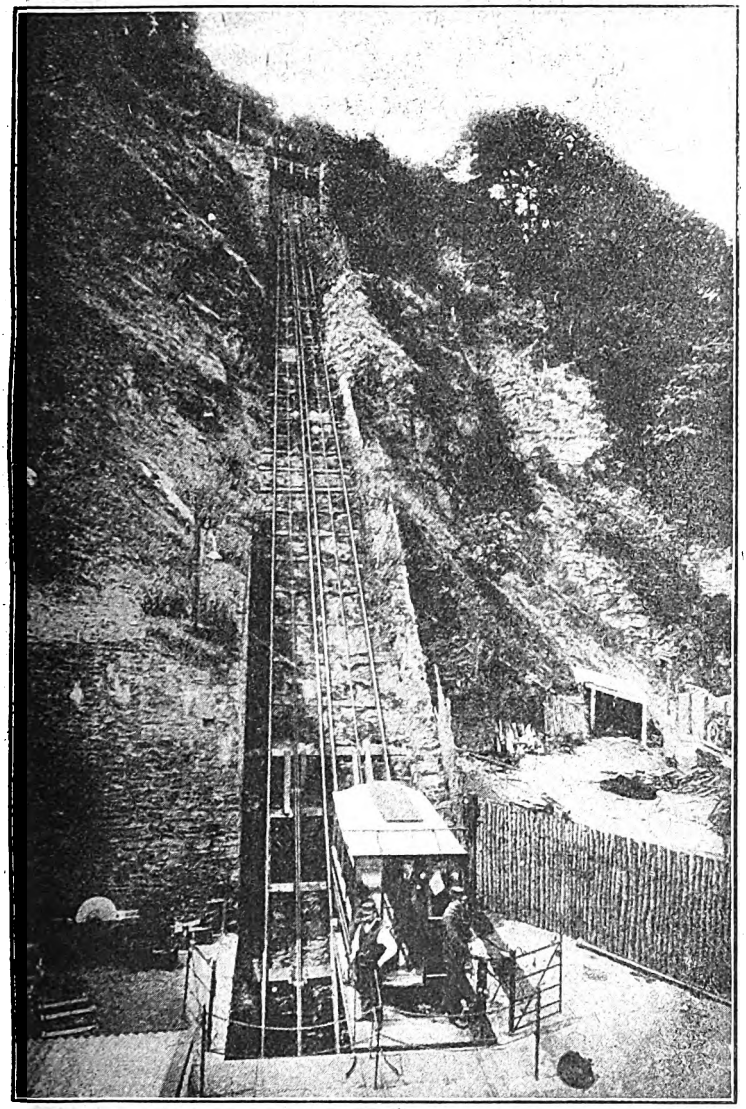

A STRIKING VIEW OF THE LYNTON AND LYNMOUTH CLIFF (CABLE) RAILWAY.

halt—Caffyn's—for the golf links, at which most trains call if required. The terminus is a neat little structure, with goods shed and sidings; but there is still a rather severe decline to be traversed by road to reach the town of Lynton, although it is about 500 ft. above sea level.

The situation of the twin resorts of Lynton and Lynmouth is somewhat remarkable. A steep winding road descends from Lynton into Lynmouth, but those who desire to avoid the walk are able to make use of the incline railway, or lift. Lynton and Lynmouth are situate on the borders of Exmoor, amid scenes of singular beauty. Among the numerous places to which visitors go are Watersmeet and Glen Lyn, the Valley of Rocks, Lee Abbey, and Lee Bay—all of which may be seen in the course of a single day by those who cannot linger longer—the Valley of the West Lyn, Heddon's Mouth, Simonsbath, Brendon Valley, Glenthorne, Porlock, Bossington Hill, Dunkery Beacon, Culbone, and the Doone Valley. This district is a paradise to the angler, and the local association let 10 miles of excellent trout and salmon fishing at a charge of 2s. 6d. per day. Well stocked with trout, the Lyn runs through some of the grandest scenery in England. Bass, skate, conger, and other deep-sea fish are also caught in considerable quantities. There are golf links at Caffyn's Down.

The incline of the Lynton–Lynmouth Cliff Railway is a long one for its type, the descending car being overweighted by water ballast so as to raise the ascending car as it goes down. At the head a fine view is had over the sea and of Lynmouth below. A feature of this lift is a "halt" a little way below the summit, so that cars can be entered or left at a spot where a road crosses the route and enables passengers to proceed direct on to the cliffs *viâ* the North Walk.

At the base is Lynmouth, with its

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diminutive harbour into which immediately runs the boulder-strewn course of the Lyn, which passes even through the village itself in a series of cascades. Indeed, whether in Lynmouth or in Lynton, the scenery is magnificent. From the latter it is an easy walk to the famous Valley of the Rocks and to the Castle Rock, while from either place it is imperative that a visit shall be paid to Watersmeet, not very far up the valley of the Lyn.

For working the Lynton and Barnstaple Railway there are four locomotives, 17 passenger train vehicles, and 24 goods vehicles. Three of the engines—No. 1 *Exe*, No. 2 *Taw*, and No. 3 *Yeo*—are 2–6–2 tank engines built by Messrs. Manning, Wardle & Co., Ltd., of Leeds. They are neat little machines with 10½ in. by 16 in. cylinders, 2 ft. 9 in. coupled wheels, 6 ft. 6 in. rigid wheelbase, 17 ft. 9 in. total wheelbase, and weighing 22½ tons in working order. The other is an American 2–4–2 engine, built by the Baldwin Co. Passenger coaches are all on bogies, and are 35 ft. long and 6½ ft. wide, placed very low on the wheels. Some are of usual compartment type, either third-class, or with some of the compartments first-class. One or two of the third-class cars are open, for observation purposes, and some others have first-class observation saloons. Upholstery is good in both classes, and with three first or four third passengers a-side are quite roomy considering the gauge.

All rolling stock is fitted with the automatic vacuum brake. On the goods side there is a fair amount of traffic, and this is largely worked attached to passenger trains. Pit wood is also now being carried in considerable quantities.

The winter time-tables provide for three trains each way on week-days, with two others on Fridays—Barnstaple market day—and one each way, for mail purposes—on Sundays. As maximum speed is limited to 25 miles per hour, and the grades and curves prevent this being attained to any great extent, the usual time for the 19½ miles, including stops, is about 87 or 88 minutes to Lynton, and a few minutes quicker returning. On market days and on special occasions loads are often considerable, and the use of pilot engines is frequently necessary, especially in the summer months, the passenger traffic being very heavy in the months of August and September.

Through bookings are in force between the Lynton and Barnstaple and the London and South Western and Great Western Railways. The staff of about 70 is under the direction of Mr. C. E. Drewitt, Secretary and Manager, with headquarters at Pilton Bridge, Barnstaple.

Mr. Drewitt entered the service of the London and South Western Railway as a junior clerk in the traffic department, in October, 1887, and was subsequently appointed to the relief staff attached to the office of the Superintendent of the Line at Waterloo. At this time the duties of the headquarters relief staff were extensive and varied, and in the course of about ten years Mr. Drewitt visited and was engaged for various periods, ranging from three days to three months, at more than one hundred of the stations and offices scattered over the London and South Western system. In 1899 Mr. Drewitt was temporarily loaned to the Lynton and Barnstaple Railway for special work at the Barnstaple headquarters of that Company, and at the expiration of twelve months he was offered and accepted the position of Secretary and Manager, which he has held since April, 1900.

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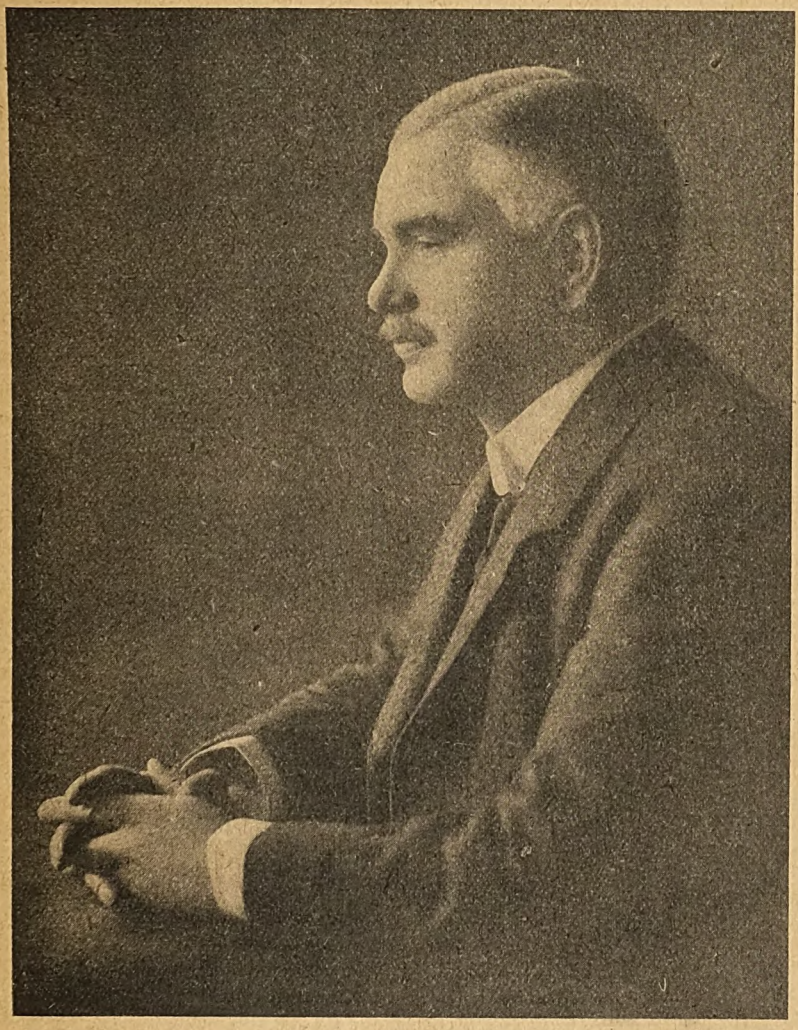
RAILWAY PORTRAIT GALLERY.



MR. HARRY BLUNDELL, M.INST.C.E.,

Chief Engineer, Great Central Railway.

MR. HARRY BLUNDELL commenced his engineering career on the North Staffordshire Railway; he afterwards transferred to the Great Central Railway (then the Manchester, Sheffield and Lincolnshire) in 1890, and eventually, in 1900, was appointed Assistant Engineer to that Company, which post he vacated two years later to take up the appointment of Chief Engineer of the Cheshire Lines Committee's Railway. During his tenure of office on the Cheshire Lines, Mr. Blundell had full charge of all engineering works, civil, mechanical and electrical, with exception of the Locomotive and Carriage and Wagon Departments. On Mr. Ball recently relinquishing the position of Chief Engineer of the Great Central Railway, Mr. Blundell was offered and accepted the post.

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The Watford Extension.

LONDON & NORTH WESTERN RAILWAY UNDERGROUND SECTION.

OPENED to the public on Monday, April 16th, 1917, the new link of the Bakerloo Railway from Willesden Junction to Watford makes the sixth extension of the Bakerloo Line since its inception in March, 1906, the previous extensions being between Kennington Road (now Lambeth), and Elephant and Castle in 1906; Baker Street and Great Central, 1907; Great Central and Edgware Road, 1907; Edgware Road and Paddington, 1914; and Paddington and Queen's Park and Willesden in 1915.

This extension of the Underground system opens up a large area of new country-side and residential districts, and directly connects the northern suburbs with the central, west-end, and south-eastern districts of London. In addition, it gives passengers using the London and North Western Railway system a choice of something like five new terminal stations in town connecting with main line railways, the new line coupling up Paddington (for Great Western Railway), Marylebone (Great Central Railway), Charing Cross (for South Eastern and Chatham Railway), and Waterloo (for London and South Western Railway), with Willesden Junction and Watford. It also means for the business man a direct linking up with the West End and Central London areas, with facilities for reaching practically every part of the Metropolis.

It was originally proposed that through running to Watford should take place at the beginning of 1917, and in this connection it is well to point out that the posters and advertising material now appearing on the stations were prepared and printed many months ago. The posters have been kept in stock until the opening date was settled, small labels being affixed showing that date.

Coming to the surface at Queen's Park, Bakerloo trains run over the electric line of the London and North Western Railway to Watford, *viâ* Willesden Junction New station. The extension has increased the length of the Bakerloo run to 20 miles 66 chains, and added another 12 stations to the line of route, the complete list of stations from end to end being:

Watford	Kilburn Park
Watford High Street	Maida Vale
Bushey and Oxhey	Warwick Avenue
*Carpenders Park	Paddington
Pinner and Hatch End	Edgware Road
Headstone Lane	Marylebone
Harrow	Baker Street
Kenton	Regent's Park
North Wembley	Oxford Circus
Wembley	Piccadilly Circus
*Stonebridge Park	Trafalgar Square
Harlesden	Charing Cross
Willesden	Waterloo
Kensal Green	Lambeth (North)
Queen's Park	Elephant and Castle

* Temporarily closed.

Through ordinary tickets are issued to and from all these stations, and also to certain stations on the Piccadilly, Hampstead, Central London, and City and South London Railways. Monthly and three-monthly season tickets can also be obtained.

At Watford, connection can be made with the London and North Western Railway branch services to Rickmansworth, St. Albans, Croxley Green, and outer suburban stations on the London and North Western Railway to Berkhamsted. Motor-bus Route, No. 142, also runs from Watford to Kilburn Park station, and feeds the railway at Bushey and Watford.

For the present Bakerloo—Watford trains do not call at Carpenders Park and Stonebridge Park on the London and North Western Railway, and they pass without calling at Maida Vale and Regent's Park, while at the rush hours trains pass other Bakerloo stations with a view to giving a quicker run and relieving them of a certain amount of local traffic. The Watford trains are distinguishable from the ordinary local services on account of the upper part of the cars being painted white, and run only on week-days, the Sunday services on the Bakerloo being confined as formerly to Willesden.

The throughout journey takes about one hour and there is a quarter-hourly service throughout the day to Watford, the total number of trains in each direction being 72. Third-class accommodation only will be provided on Bakerloo trains.

First and last trains from Elephant and Castle and Watford are:

	FIRST.	LAST.
From Elephant & Castle	5.16 a.m.	12.52 a.m.
From Watford	5. 0 a.m.	10.45 p.m.

With the inauguration of this new service

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ELECTRIFICATION OF LONDON AND NORTH WESTERN RAILWAY TO WATFORD.

1. Central London motor-car for working trains on the Bakerloo–Watford Extension.
2. Bakerloo–Watford train in Willesden Junction New station.
3. Headstone Lane station. Note the gatewoman on the train.
4. Bakerloo train in Watford station.

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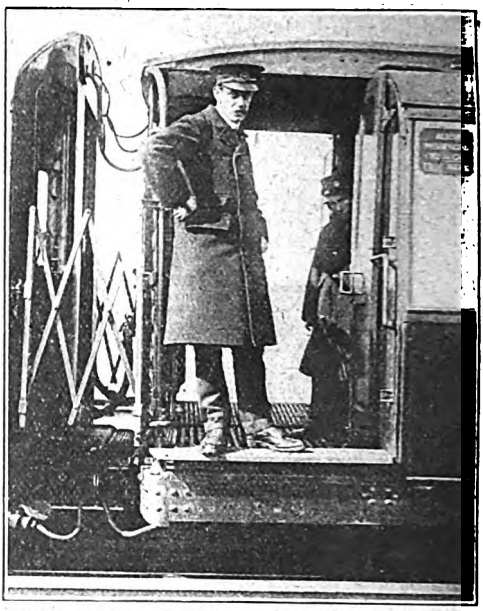
a number of steam trains running between Euston, Willesden and Watford have been taken off during the slack periods of the day, and in their place new steam services are run between Euston and Willesden New station affording direct connection with the Bakerloo trains between this latter point and Watford. Similar connections have also been given in one or two cases by existing steam trains running between Euston and Willesden main line station (adjoining the new station). The London and North Western Railway steam trains between Watford and Euston and Watford and Broad Street over both the main and new lines will continue to run during the busy morning and evening rush hours.

Each train consists of five cars, two motor cars and three trailers. The latter are standard London Electric Railway stock, while the motor cars were designed for the Ealing Central London Railway extension from Wood Lane over the Great Western new line to Ealing Broadway, the opening of which has had to be postponed. The motor cars are provided with a covered vestibule at the trailing end and that middle doors have been fitted. The control of the latter is similar to the new stock for the Queen's Park Extension.

This is the first tube stock to be run in passenger service on a main line, and provision has had to be made to enable passengers to get on or off at the stations on the London and North Western line which have platforms of the standard main line height. This has been done on the trailer cars by superimposing a raised platform on the existing gangways of these cars. It has been possible to do this without encroaching on available headroom owing to the open character of these gangways. The closed vestibule has prevented any similar provision being made on the motor cars. The number of seats in the motor cars is 32 and in the trailer cars 52.

In the motor cars the seats are upholstered in red Pegamoid. The seats in the trailer cars are being upholstered in moquette, but some of the cars have entered service at the start with the original rattan seats. The interior steel panels of the motor cars are painted a light brown to tone in with the colour of the mouldings, etc., which are of teak or steel, painted to match.

Lamp fittings and ends of cross seats are finished in oxydised bronze; other fittings are of aluminium alloy. The ceiling of the arch roof is of agasote, enamelled flat white,



RAISED GANGWAY TO EQUALISE DIFFERENCE IN LONDON AND NORTH WESTERN AND BAKERLOO PLATFORM LEVELS.

and the exterior colour of the cars is lake, with white upper panels and gold lettering. With regard to ventilation, in addition to the ordinary drop lights, an air duct with perforations runs the whole length of the car, and is open to the air at the ends.

The cars are constructed of steel, with some wood interior finish.

The motor trucks are of the equaliser bar type, with helical springs. The framing is built up of mild steel rolled sections and the trailer trucks are built up of pressed steel sections, and are fitted with laminated side-bearing springs.

Leading dimensions and weights are :—

Length overall	47ft. 9in.
Width over body	8ft. 9in.
Total height from rail	9ft. 3¼in.
Centres of bogies	29ft. 6in.
Diameter of motor wheels ..	36in.
Wheelbase of motor bogie ..	6ft. 8in.
Diameter of trailing wheels ..	29in.
Wheelbase of trailer bogie ..	5ft.
Weight of car completely equipped :	
Motor end	21⅛ tons.
Trailer end	9⅛ ,,
Total	30¼ tons.

Total weight of 5-car train (unloaded), 110 tons.

Brake equipment is Westinghouse with improved triple valves on the motor cars and quick-acting triple valves on the trailers.

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A FINE "MACKAY" PHOTOGRAPH.

Photo] [*F. E. Mackay.*

GREAT CENTRAL RAILWAY.

Manchester to Hull and Cleethorpes express near Godley Junction.

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British Railway Service and the War. [XIII.]

IN the newspaper press there was a general chorus of approval when recent announcement was made that Sir Eric Geddes, the Deputy General Manager of the North Eastern Railway, had been appointed Inspector-General of Transportation in all theatres of war. He retains his position on Field-Marshal Sir Douglas Haig's staff as Director-General of Transportation, but vacates his post at the War Office as Director-General of Military Railways. Sir Guy Granet, General Manager, Midland Railway, has been appointed to succeed Sir Eric Geddes at the War Office, with the title of Director-General of Movements and Railways, and he has likewise been appointed a civilian member of the Army Council. Further demands have been made upon the railways in common with other reserved occupations to supply more men for war service. Statements prepared three months ago showed that about 140,000 British railway men had been released, representing from 20 to 25 per cent. of the staff employed. The figures in January last for ten of the principal English lines, as provided in a recent return, are as under:

	Men released.	Per cent.
Great Central	7,665	22·2
Great Eastern	7,033	20·8
Great Northern	6,749	19·5
Great Western	19,849	25·0
Lancashire and Yorkshire ..	8,009	21·1
London, Brighton & South Coast	3,891	23·9
London and North Western ..	22,218	23·9
London and South Western ..	4,612	19·0
Midland	15,168	20·4
North Eastern	13,624	25·2

Of special interest to railwaymen in the St. Helens district is the announcement of the appointment of Second-Lieut. W. Worsley, R.O.D., Royal Engineers, to the rank of Captain. Formerly employed on the London and North Western Railway, he relinquished the post of Assistant Traffic Superintendent, Central Argentine Railway, Rosario, to return to England. He enlisted in October, 1914, in the King's Royal Rifles. His familiarity with the handling of men caused him to be made a corporal on the spot, with promotion to sergeant at the end of the first week. Passing the winter of 1915-16 on active service in France, his resourceful handling of his platoon gained him the rank of company sergeant-major, and subsequent promotion to a commission in the Royal Engineers.

Sir Vincent Raven, Chief Mechanical Engineer, North Eastern Railway, will have deep sympathy throughout British railwaydom in the loss he has sustained in the death of his youngest son, Lieut. Frederick Gifford Raven, of the Railway Section of the Royal Engineers. Death resulted from wounds received from an explosive shell, which, it is said, contained poison. The gallant young officer—he was only 26—was formerly in the service of the Indian State Railways, and returned to England a few months ago to join the Army.

Mr. C. Lewis Edwards, Chief Accountant of the Great Northern Railway, has been elected Deputy-Chairman of the Accountants' Sub-Committee of the Railway Executive Committee—a very important section of railway war-time organisation.

Among the minor incidents arising out of the War perhaps not the least satisfactory has been the inception and conduct of the Western District, London and South Western Railway, Employés War Fund. The fund was opened in September, 1914, when patriotic funds of all kinds were springing up like mushrooms, some of them perishing with equal facility. Speaking at a gathering of all departments and grades in September, 1914, the Western District Superintendent, Mr. A. H. Hoyle, pointed out the danger of allowing early zeal to outrun discretion, and that a small contribution of say about twopence weekly continued regularly was better business than spasmodic donations at infrequent intervals. The feeling of the staff was in the same direction, and a representative committee was elected comprising: Mr. A. H. Hoyle, District Superintendent, Hon. Treasurer; Mr. Harding, Engineers' Department; Mr. Rivers, Signal and Telegraph Department; Mr. Wright, Locomotive Running Department; Mr. Blaney, Goods Guard; Mr. Drew, Locomotive Fitting

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Shops; Mr. Greenway, Carriage Department; Mr. Balment, Goods Department; Mr. Lawrence, Gas and Water Department; Mr. Northmore, Bill Inspector, acting as Hon. Secretary. It is pleasing to note that the vast majority of the original subscribers have abided by their resolve to do their bit until the necessity for the fund ceases, and on February 28th last the excellent total of £1,000 6s. 11d. was reached.

A pleasing war-time ceremony recently took place in Blythswood Square, Glasgow, when two motor ambulance cars presented to the Scottish Red Cross Branch by the directors, officers and employés of the Glasgow and South Western Railway were formally handed over by Sir James Bell, Bart., Chairman of the Railway. The cars bear the inscription, "Glasgow and South Western Railway" (gift from the directors, officers and employés), and are intended for the use of sick and wounded soldiers in France. It is worthy of note that the Glasgow and South Western Railway has no less than 1,750 former employés now serving with the Colours, and the handsome gift made to the Scottish Branch of the British Red Cross Society affords a further striking proof of the sentiments of loyalty and patriotism which appear to animate everyone connected with the Glasgow and South Western Railway.

The library of the London School of Economics recently received two collections of books bequeathed by former students of the School, both of whom have been killed on the Western front. One gift is a small collection of railway books from the late Lieut. H. W. P. Sarson, of the King's Own Yorkshire Light Infantry (formerly of the Superintendent's Department, South Eastern Railway, London Bridge station), who was killed on October 21st, 1916, less than five weeks after leaving home for the front. The collection has been provided with a special book-case in the Acworth Library on Transport at the school, and a framed portrait of the donor is with the collection.

Directors, officers and staff of the Lancashire and Yorkshire Railway have ample reasons for being proud of the distinctions gained by Lancashire and Yorkshire railway men in the European war. From a long and noteworthy list the following may be cited:

T. Barnes, Sergt., Manchester Regt. (Clerk, Chief Cashier's Office). Awarded Military Medal for gallantry and devotion to duty in the operations on the Somme.

J. W. Bennett, Pte., Lancashire Fusiliers

MOTOR AMBULANCE CARS PRESENTED TO SCOTTISH RED CROSS BY GLASGOW AND SOUTH WESTERN RAILWAY DIRECTORS, OFFICERS AND STAFF.
Left to right: Transport Officer Stevenson; Mr. R. J. Smith; Mr. David Cooper (General Manager); Sir James Bell, Bart. (Chairman); Sir George Beatson, M.D., K.C.B.; Mr. Thomas Downes.

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(Extra Porter, Chief Goods Manager's Department, Bury). Awarded Military Medal for bravery in the field.

T. J. Cartwright, Pte., West Riding Regt. (Labourer, Chief Mechanical Engineer's Department, Sowerby Bridge). Awarded Military Medal for bravery in the field.

J. W. Cooper, Corpl., West Yorkshire Regt., T.F. (Extra Porter, Chief Goods Manager's Department, Leeds Joint). Awarded Military Medal. Mentioned in despatches, November 30th, 1915, for gallant and distinguished service in the field. "Cooper" was severely wounded in action on August 26th, 1916, and died of his wounds in Hospital in Suffolk, on September 27th, 1916. Interred with full Military Honours, October 2nd, 1916.

A. Ferguson, Corpl., Duke of Wellington's West Riding Regt. (Cleaner, Chief Mechanical Engineer's Department, Mirfield). Awarded Military Medal for bravery in the field.

W. E. Flockton, Sapper, Royal Engineers (Apprentice Fitter, Chief Mechanical Engineer's Department, Horwich Works). Awarded Military Medal for bravery in the field.

T. Frayne, Pte., Machine Gun Corps (Cleaner, Chief Mechanical Engineer's Department, Goole Loco.). Awarded Military Medal for bravery in the field.

J. Greenwood, Driver, Royal Field Artillery (Ballastman, Chief Civil Engineer's Department, Sowerby Bridge). Awarded Military Medal.

J. Haworth, Sergt., Service Battalion Manchester Regt. (Clerk, Carriage and Wagon Department, Newton Heath). Awarded Military Medal for bravery in the field.

C. S. Hinsley, Driver, West Riding Battery, Royal Field Artillery, T.F. (Telegraph Clerk, Department of Superintendent of the Line, Knottingley). Awarded Military Medal for distinguished service in the field.

J. Hogan, Driver, Ammunition Column, Royal Field Artillery (Porter and Reserve Shunter, Chief Goods Manager's Department, Darwen). Awarded Military Medal for bravery in the field.

W. Howland, Rifleman, West Yorkshire Regt., T.F. (Porter, Chief Goods Manager's Department, Leeds Joint). Awarded Military Medal for bravery in the field.

R. Jennings, Sergt., R.A.M.C. (Capstan-man, Chief Goods Manager's Department, Great Howard Street, Liverpool). Awarded Military Medal for bravery in the field.

F. M. Lundberg, Lance-Corpl., Liverpool Regt. (Globe Cleaner, Carriage and Wagon Department, Liverpool). Awarded Military Medal for bravery in the field.

F. W. Moxon, Sergt., Manchester Regt. (Clerk, Chief Goods Manager's Department). Awarded Military Medal for bravery in the field.

J. Oldridge, Lance-Corpl., Yorkshire Light Infantry (Cleaner, Chief Mechanical Engineer's Department, Goole). Awarded Military Medal for bravery in the field.

W. A. Otty, Lance-Corpl., King's Liverpool Regt. (Wagon Repairer, Carriage and Wagon Department, Fazakerley). Awarded Military Medal for bravery in the field.

B. Roberts, Pte., Lancashire Fusiliers (Shunter, Chief Goods Manager's Department, Salford). Awarded Military Medal for bravery in the field.

E. Spedding, Pte., R.A.M.C. (Night Porter, Department of the Superintendent of the Line, Bolton). Awarded Military Medal for bravery in the field.

P. Spurr, Pte., King's Own Yorkshire Light Infantry (Striker, Carriage and Wagon Department, Dewsbury Junction). Awarded Military Medal for bravery in the field.

A. Sutherland, Corpl., Yeomanry (Booking Clerk, Department of the Superintendent of the Line, Blackpool, Talbot Road). Awarded Military Medal for bravery in the field.

F. H. Wheatcroft, Pte., Manchester Regt. (Telegraph and Joint Clerk, Department of the Superintendent of the Line, Blackrod). Awarded Military Medal for bravery in the field.

W. Fairhurst, Sergt., King's Liverpool Regt. (Ballastman, Chief Civil Engineer's Department, St. Luke's). Awarded Military Medal.

R. J. Thomas, Lance-Sergt., Royal Welsh Fusiliers (Sheeter, Chief Goods Manager's Department, Great Howard Street, Liverpool). Awarded Military Medal for bravery and devotion to duty in a marked degree in repairing telephone wires connecting his Company with Battalion Headquarters, under heavy shell fire.

G. L. Onley, 1st Class Stoker, Royal Navy (Carter, Chief Goods Manager's Department, Oldham Road). Awarded a Medal by Czar of Russia as a recognition of services rendered.

L. B. Mills, Pte., King's Liverpool Regt., Reserve (Deputy Assistant Manager, Hotel Department). Awarded the French Croix de Guerre. Detached with the Commander of an Infantry Regiment to assure conjunction with the King's Liverpool Regiment, has

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[Photo] [L. Langfier, 16, Brook St,. W.

MR. HENRY W. THORNTON,
General Manager, Great Eastern Railway,
as
Hon. Lieut.-Colonel of the Engineer and Railway Staff Corps.

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fulfilled his mission with the greatest devotion and courage.

E. C. Simpson, Capt., Military Forwarding Officer, Assistant, Antwerp Office (Chief Goods Manager's Department). Awarded Military Cross in recognition of special services rendered in connection with Railway Transport in France.

T. C. Simpson, Sec. Lieut. (Temp. Lieut.), Royal Engineers, T.F. (Assistant, Chief Civil Engineer's Department). Awarded Military Cross.

J. N. Peck, Acting Lieut.-Col., King's Liverpool Regt. (Assistant, Chief Civil Engineer's Department). Awarded Military Cross.

F. J. Powell, Capt. and Flight Commander, Flying Corps (Clerk, Chief Goods Manager's Department, St. Annes). Awarded Military Cross.

C. Brownlow, Corpl., East Yorkshire Regt., Regular Army (Extra Porter, Chief Goods Manager's Department, Leeds Joint). Awarded Distinguished Conduct Medal for conspicuous courage and ability displayed while employed on patrolling and scouting duty; also erecting barbed wire.

H. Dixon, Corpl., Manchester Regt. (Goods Shunter, Department of Superintendent of the Line, Miles Platting). Awarded Distinguished Conduct Medal for conspicuous gallantry in assisting an officer to carry, under heavy shell fire, a badly wounded man to a place of safety. On another occasion he again assisted to carry wounded men, under a heavy fire, from a listening post back to the fire trench.

T. J. Edwards, Company Sergt.-Major, Loyal North Lancashire Regt. (Blacksmith, Chief Mechanical Engineer's Department, Horwich Works). Awarded Distinguished Conduct Medal for conspicuous gallantry in action. Although wounded he successfully rallied and led his Company on to the assault after his Officers had become casualties. On another occasion his fine example during a heavy bombardment gave great confidence to his Company.

A. E. Hall, Pte., Manchester Regt. (Clerk, Audit Accountant's Department). Awarded Distinguished Conduct Medal for conspicuous gallantry. When an enemy shell set fire to a bomb and ammunition store he assisted an Officer, although they had just both been knocked over by the explosion of the shell, to organise a party for the removal of the ammunition. They carried out their work under the continual explosions of bursting bombs.

T. Hayes, Pte., Yorkshire Regt. (Examiner, Carriage and Wagon Department, Sowerby Bridge). Awarded Distinguished Conduct Medal for gallant conduct on many occasions in conveying messages whilst exposed to heavy fire.

J. Horner, Acting Company Sergt.-Major, East Lancashire Regt. (Storekeeper, Chief Civil Engineer's Department, Bolton). Awarded Distinguished Conduct Medal for gallantry and devotion to duty throughout an arduous period in trenches and in attack. When his Company Officers had all become casualties, he showed great ability in reorganising and controlling his command.

H. Leatham, Driver, Royal Field Artillery

LIEUT.-COLONEL F. A. CORTEZ LEIGH, R.E.,
Chief Electrical Engineer,
London and North Western Railway.

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(Cleaner, Chief Mechanical Engineer's Department, Low Moor). Awarded Distinguished Conduct Medal for conspicuous gallantry and devotion to duty as Medical Officer's Orderly. On several occasions he displayed the greatest pluck when assisting the Medical Officer, under heavy fire, he has shown throughout an utter disregard of danger and has done fine work among the wounded.

A. Marshall, Pte., Cheshire Regt. (Washer, Carriage and Wagon Department, Sowerby Bridge). Awarded Distinguished Conduct Medal for distinguished conduct in the field.

E. Ouldcott, Pte., Royal Welsh Fusiliers (Shaper, Chief Mechanical Engineer's Department, Horwich Works). Awarded Distinguished Conduct Medal for conspicuous gallantry during and after an attack. He rescued, under heavy artillery and machine gun fire, many wounded men, voluntarily remaining behind when his battalion was relieved, and assisting to carry in the wounded of another regiment.

H. L. Sheard, Lance-Corpl., Duke of Wellington's Regt. (Assistant Connector, Chief Civil Engineer's Department, Mirfield). Awarded Distinguished Conduct Medal for consistent good work throughout the campaign, notable on the Yser Canal, on November 17th, 1915, when he attended to a wounded man under heavy rifle and machine gun fire, and although wounded himself he refused to leave his wounded comrade until he was satisfied no more could be done for him.

G. Stewart, Pte., Lancashire Fusiliers (Engine Cleaner, Chief Mechanical Engineer's Department, Bury Locomotive Shed). Awarded Distinguished Conduct Medal for conspicuous gallantry in rescuing several wounded N.C.O.'s and men who were lying in the open exposed to heavy fire. On a subsequent occasion he again rendered valuable service under heavy fire.

T. D. Withers, Sergt., King's Royal Lancaster Regt. (Engineer, Steam Hopper *Preesall*, Chief Civil Engineer's Department, Fleetwood). Awarded Distinguished Conduct Medal for conspicuous gallantry during operations. He brought up supplies to the firing line under very heavy shell fire.

W. H. Clapp, A.B., (Shunter, Chief Goods Manager's Department, Rochdale). Awarded Distinguished Service Medal for service during evacuation of the Gallipoli Peninsula.

G. Stockham, Pte., Ply., S.B.S., R.N.A., S.B.R. (Leading Washer, Carriage and Wagon Department, Bolton). Awarded Distinguished Service Medal for services with the Mediterranean Expeditionary Forces.

E. Walch, Staff Sergt., Royal Naval Sick Berth Reserve (Shunting Inspector, Chief Goods Manager's Department, Bolton). Awarded Distinguished Service Medal for conspicuous service whilst in command of the Ambulance Section of the Naval Brigade during the bombardment of Antwerp.

DON'T FORGET
YOUR FRIEND
IN THE FORCES.
SEND HIM A
RAILWAY MAGAZINE.

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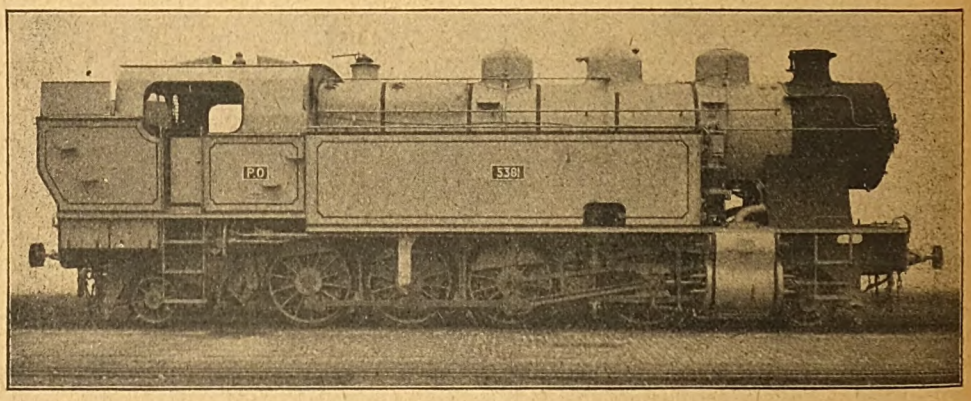
British-Built Locomotives for France.

Some new express locomotives of the 4–6–0 type and tank engines of the 2–8–2 type are under construction in Glasgow, at the works of the North British Locomotive Company, Ltd., for the Paris–Orleans Railway. Through the courtesy of the builders, the RAILWAY MAGAZINE is enabled to illustrate a 2–8–2 tank engine. This locomotive is equipped with two outside single-expansion cylinders. The cylinders are of unusually large diameter for a European locomotive working simple; the dimension being 23⅝ in. Superheated steam is distributed by inside admission piston valves operated by Walschaerts' motion, and the same arrangement of by-pass valves as that described above is utilised in the design. In spite of the fact that eight-coupled wheels are employed the rigid wheelbase amounts to only 4 ft. 11 1/16 in., this representing the distance between the centres of the driving and third pair of coupled wheels. The leading and trailing coupled wheels are allowed 11/16 in. side play on each side. They are connected with their respective bogie wheels on the "Zara" system. The boiler is pitched at a high level, namely, with its centre 9 ft. 6 3/16 in. above the rails. The train heating apparatus is on the Lancrenon system, using steam and compressed air. Principal particulars are as below :—



PARIS–ORLEANS RAILWAY.

Heavy Tank Locomotive, 2–8–2 Type, No. 5381.
Built to the designs of Mons. E. Solacroup, Ingenieur-en-chef du Material et de la Traction, by the North British Locomotive Co., Ltd.

Cylinders—		Heating surface—	
Diameter	23⅝ in.	Tubes	1,304 sq. ft.
Stroke	25 9/16 in.	Firebox	155 ,,
Wheels—		Total ..	1,459 ,,
Front bogie, diameter	2 ft. 9⅞ in.	Superheater	423 ,,
Coupled, diameter ..	4 ft. 7⅛ in.	Total ..	1,882 ,,
Hind bogie, diameter ..	2 ft. 9⅞ in.	Firegrate area	29·3 ,,
Wheelbase—		Tractive force at 75 per cent. of boiler pressure	33,000 lbs.
Rigid	4 ft. 11 1/16 in.		
Total	31 ft. 10 in.		
Working pressure ..	170 lbs. per sq. in.		
Boiler feed	2 injectors, No. 10.		

The engine weighs in working order 91 tons 4½ cwt., and of this 66 tons 8 cwt. are available for adhesion, an average load per coupled axle of 16 tons 12 cwt. The maximum load on an individual axle is 17 tons 13 cwt., this being the proportion carried by the leading coupled axle. The tank capacity is 2,200 galls., and a fuel space of 4 tons is provided. The approximate drawbar pull exerted by the engine is 8,000 lbs. at 30 m.p.h. on the level and 10,000 lbs. on a 1 in 200 grade at 25 m.p.h.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, neither should queries be of purely local interest. Before asking for information concerning railway history and the like, RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," a new edition of which has just been published.*

Great Western Railway Locomotives.

There is no truth in the rumour that *The Great Bear* has been scrapped. In the April RAILWAY MAGAZINE particulars of the present working of this locomotive were given. Since it was built in 1908 the engine has been fitted with superheating apparatus, but otherwise has sustained no structural alteration.

[Reply to F. C. IMBUSH.]

In response to Mr. Hewitt's remarks in April RAILWAY MAGAZINE concerning Great Western Railway No. 11 class, Mr. W. Beckerlegg writes: "The engine of the 2-4-2T type broken up during 1916 was No. 1304, formerly *Plynlimmon* on the Manchester and Milford Railway. This still leaves the Great Western Railway with 37 engines of the 2-4-2T type—the numbers being 3600 (originally 11), 3601-30; Port Talbot, No. 36, stationed at Llanelly; Rhondda and Swansea Bay, Nos. 12, 13, 17, 18 and 19."

Another RAILWAY MAGAZINE reader, Mr. W. P. Martin, says:—"Mr. Hewitt is in error in supposing that the Great Western Railway '3600' class of locomotives has been condemned. Apparently his supposition is based on nothing more substantial than the condemnation of a $\frac{2\text{-}4\text{-}2}{T}$ locomotive in 1916. In December, 1915, the Great Western Railway owned 38 engines of this classification, but of these the '3600' class only numbered 31. One was an old engine, No. 1304, of much smaller dimensions, built by Sharp, Stewart & Co. in 1891, and this, I understand, was scrapped last year. The Great Western Railway stock also included two or more $\frac{2\text{-}4\text{-}2}{T}$ locomotives built by Kitson for the Rhondda and Swansea Bay Railway, which were taken over when a working arrangement was made with that company, and some years ago one or more of the later locomotives of the $\frac{2\text{-}4\text{-}0}{T}$ type had an additional pair of wheels added to enable a larger coal bunker to be used.

[Replies to RICHARD F. L. TYRRELL.]

Tractive Power of Locomotives.

We assume that "power" in this question is intended to mean tractive power. In calculating the *nominal* tractive power of a locomotive neither adhesion weight (*i.e.*, the weight resting on the coupled wheels) nor heating surface are taken into account, the formula being, for a 2-cylinder simple engine, $T = \frac{D^2SP.}{W}$ where T = Tractive Force, D = Diameter of Cylinders, S = Stroke of Cylinders, P = Effective Working Pressure, and W = Diameter of Driving Wheels. The same unit of measurement, needless to say, must be used for all these dimensions, either inches throughout or feet throughout, and the result is given in pounds. It is customary to calculate the effective working pressure as 75 to 80 per cent. of the nominal working pressure. As regards the weight on the driving wheels, it is essential that this shall be sufficiently great to utilise to the full the tractive power developed in the cylinders without the engine "slipping." With this object in view, two, three or more pairs of wheels are coupled together in order that as large a proportion as possible of the weight of the engine may be available for adhesion. The importance of heating surface lies in the fact that the steaming powers of the engine are based upon its nature and extent. But this is rather too extensive a subject to deal with adequately in the "Why and Wherefore" pages.

[Reply to JOHN R. NICHOLSON.]

The Computation of Train-Loads.

On certain lines the weight of each coach is clearly marked at some point on it. On the London and North Western and Caledonian Railways these weights are given in large white figures on each end of the coach, about half-way between the platform level

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and the roof. On the Great Northern, North Eastern, Midland, North British, and Glasgow and South Western Railways the weights are shown on small white tablets at the ends of the coaches, immediately under the roof. The Great Western Company marks them on the sole-bar or frame of the coach, at one end, just above the footboard. Certain other companies also paint them on the position last-mentioned, but after a time they become indecipherable through dirt, whereas on the lines previously mentioned the tablets are usually kept clean, as the train-loads of their expresses are in most cases reckoned in tons, instead of, as previously, by the number of axles, or of vehicles. Speaking generally, a rough approximation for a corridor train of modern stock is to multiply the number of axles by 7, giving the empty weight of the train in tons, and then to add from 5 to 10 per cent. for passengers and luggage, according to whether the train is well-filled or "packed." But wherever possible the compiler of records, if they are to have the value of accuracy, should read the weight of the trains from the vehicles themselves.

[Reply to R. D. GAULD.]

Rebuilt Midland 4-4-0 Johnson Engines.

Mr. W. T. Brown writes: "In the April RAILWAY MAGAZINE Mr. Stewart states that the unrebuilt Johnson 4–4–0 engines on the Midland Railway are numbered from 301 to 328. This is incorrect. The numbers of these engines are 300–327. No. 328 is a rebuilt 7 ft. wheel engine with Belpaire firebox and extended smokebox. Most of the 300–327 engines are at Sheffield and are often employed in piloting goods trains. They have been rebuilt at dates varying from 1900 to 1913, with small boilers."

Cadet M. Reilly kindly communicates: "One of your correspondents states that all the Midland 4–4–0 from 301 to 328 were unrebuilt. It may be of interest to many readers to know that 323 is an exception. She was rebuilt some years ago with a slightly larger boiler and an extended smokebox, but she retained her spring balance valves and her original cab and splashers. She is absolutely unique and has a very good reputation among the men. No. 323 is stationed at Derby and often works either to Birmingham or to Loughborough and Leicester, taking turns with the class 2 superheaters on secondary main line duties."

[Further replies to T. G. FENDICK.]

Great Chesterford and Newmarket Railway.

Embankments and cuttings seen alongside the main road from Great Chesterford to Newmarket, Cambs., are those of a line called the Newmarket Railway, which was opened in 1848. It was two years prior to this date that the trustees of the Newmarket Jockey Club obtained the Act authorising the construction of this line, which effected a junction with the Eastern Counties Railway at Great Chesterford, and was worked for a short time as an independent concern. Shortly afterwards an extension was authorised from Newmarket to Thetford *viâ* Bury St. Edmund's; this was called the Newmarket–Bury Extension Railway, and was opened in 1854. Meanwhile the Eastern Counties Railway had absorbed the original Newmarket Railway, paying £15 for each £10 share, and on the completion of the branch from Cambridge to Newmarket *viâ* Fulbourn the Newmarket Railway was closed, and has since been derelict. In view of the growing importance of Newmarket as a racing centre, it would not be surprising to see this old route re-opened, as it saves fully 12 miles in the distance from London to Newmarket.

[Reply to F. T. HUNWICKE.]

Crewe and Toton.

In response to an enquiry as to whether Toton Colliery sidings are larger than the whole of Crewe sidings including the station the following data from official sources is given. The acreage of Crewe sidings, including the station: Commencing at Casey Lane Bridge, near 156¼ mile-post to Crewe Coal Yard, 159 mile-post main line, and extending to the Motor Halt at Gresty (Crewe and Shrewsbury Line), Manchester Bridge (Crewe and Stockport Line), Mill Street Bridge, including the engine shed and sidings (Crewe and Chester Line), but excluding the Locomotive Works and Yard, amount to approximately 260 acres. Toton Colliery sidings occupy 140 acres.

[Reply to Sergt. W. FIELD.]

London and North Western Railway Engines.

London and North Western Railway locomotive, No. 1361, *Prospero* is still running as a four-cylinder engine. It is stationed at Crewe, and works chiefly on the Holyhead section. The London and North Western Railway 4–6–2 and 4–4–2 tanks are both

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pressed at 175 lbs., and the 0-6-2 tanks at 150 lbs.

[Reply to E. EVANS.]

Mr. G. F. W. Hamel states that No. 790 *Hardwicke* is still running on the main line, though her duties appear to be varied. Mr. Hamel saw the engine at Rugby during March.

[Reply to REX LEATHLEY.]

Lickey Incline, Midland Railway.

Lickey incline is situated between Blackwell and Bromsgrove, on the West of England section, and has for two miles a gradient of 1 in 37·7, falling from the former to the latter station. It is the steepest incline on any main line in these islands. All northbound trains are banked in rear from Bromsgrove, where a special stop is made to attach the bank engines—usually one or two 0-6-0 tank locomotives—but the latter are detached at Blackwell without the train making a second stop. South-bound express trains all stop momentarily at Blackwell as a "brake test" before descending the bank.

[Reply to R. D. GAULD.]

Great Central Railway Expresses via High Wycombe.

The only Great Central express trains using the Great Western and Great Central Joint Line *viâ* High Wycombe are the 10.0 a.m. and 6.10 p.m. from London to Bradford, and the 12.15 p.m. to Manchester, in the down direction, and the 5.0 p.m. from Bradford to Marylebone on the return journey. As the last-named, as well as the 10.0 a.m. *ex*-Marylebone, is suspended for the present, there are now no Great Central Railway up expresses running *viâ* Wycombe.

[Reply to M. A. OLDHAM.]

Loading Gauges.

Maximum height allowed from rail level to the top of the chimney is 13 ft. 6 in. on the London, Brighton and South Coast Railway, 12 ft. 11 in. on the North British Railway, and 13 ft. on the Highland Railway. The wheelbase and weight in working order of the new Highland Railway 4-4-0's and the Caledonian Railway 938-943 series of 4-6-0 engines have not yet been made public.

[Reply to IAN PERMAN.]

The 720 Class 4-2-2-0 Engines, London and South Western Railway.

Of the four cylinders of these engines, the valves of the outside cylinders are operated by Joy's valve-gear, placed outside the frames, and those of the inside cylinders by Stephenson's link motion, in the usual position between the frames. Both sets of motion are reversed simultaneously by means of a combined steam reversing arrangement.

[Reply to I. W. VOELCKER.]

Sir Charles Scotter.

The late Sir Charles Scotter received his Knighthood in January, 1894. His appointment as General Manager, London and South Western Railway, dated from March 1st, 1885. Previous to taking office at Waterloo, where he succeeded Mr. Archibald Scott, he had been from 1873 Goods Manager of the Manchester, Sheffield and Lincolnshire Railway. His railway career began at Hull.

[Reply to A. FREW.]

Cuffley to Stevenage.

It is not anticipated that any very serious efforts will be made to complete this new line of the Great Northern Railway until after the War. At the moment no idea of the date when it will be opened can be given.

[Reply to M. A. OLDHAM.]

Paddington Station.

Platforms Nos. 1, 2, 3 and 4 are departure ones. Nos. 5 and 6 are used for both arrival and departure. Nos. 7, 8 and 11 are arrival. No. 12 is for milk traffic. Nos. 9 and 10 are not yet in use.

[Reply to W. A. E. WESTALL.]

"E.D."

Initials "E.D." on railway wagons usually indicate that they are reserved for the use of the Engineer's, or Civil Engineering Department, to convey ballast, sleepers, rails, etc.

[Reply to R. D. GAULD.]

Kensington-Richmond Line.

January 1st, 1869, was date of the opening of the recently closed Kensington-Richmond line of the London and South Western Railway.

[Reply to R. D. J.]

Great Western-Central London Ealing Extension.

So far as we can ascertain there is no intention of opening this line during the War.

[Reply to R. D. J.]

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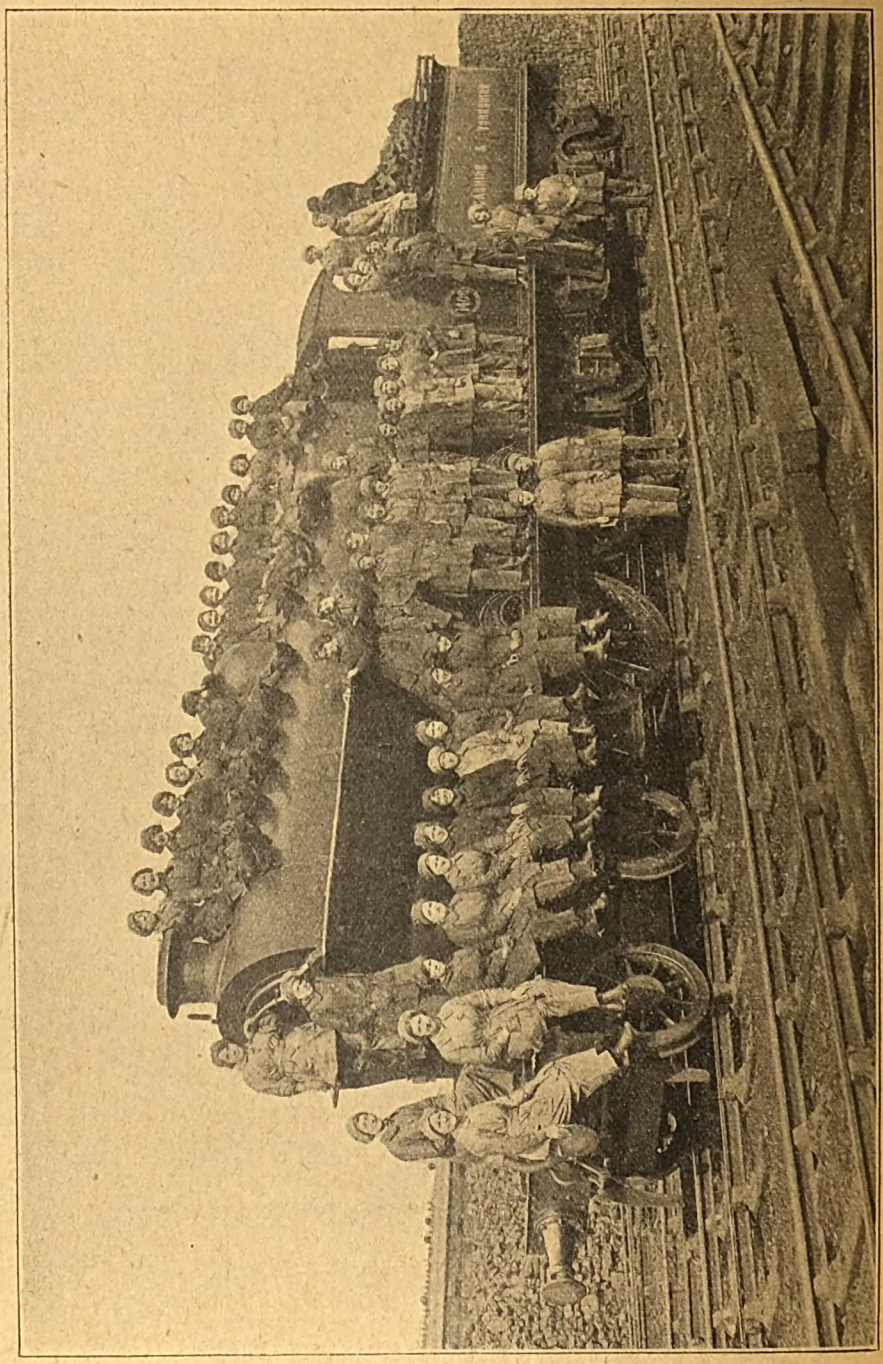

WOMEN WAR WORKERS IN RAILWAY SERVICE.
Engine cleaners, Low Moor District Locomotive Sheds, Lancashire and Yorkshire Railway.

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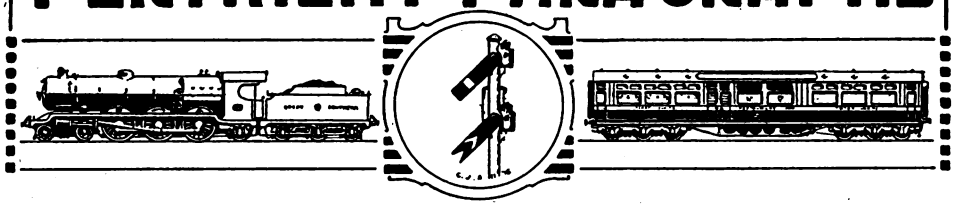
PERTINENT PARAGRAPHS



London's Means of Transit.

At the recent monthly Operating Department efficiency meeting of the London Underground Railways and London General Omnibus Companies group, held at the London General Omnibus Companies Training School, Chelsea, there was an attendance of some 250 members of the control staffs, Mr. H. E. Blain, Operating Manager, presiding. A paper, "Means of London Transit," was given by Mr. John C. Mitchell, F.C.I.S., Treasurer to the Companies, this being illustrated by a fine collection of slides.

After describing the various definitions of the term "London" in use in connection with local government, police, water and other administrative purposes, Mr. Mitchell gave an historic review of the means of London transit so far as concerned omnibuses, railways, and tramways, commencing with the shillibeer horse omnibus of 1829, and tracing its evolution through the various types of horse vehicles to the earlier types of motor vehicles, and the present motor omnibus. Particulars with regard to omnibus traffic, from the days when 1s. was charged from Paddington to the Bank, the fare including the provision of light literature, were given, also a description of the sale of "times," the term under which the goodwill to the "right" of operating a 'bus on a certain time-table, on a certain route, was known.

The history of the London General Omnibus Company through its various developments, of its principal rival, the London Road Car Company, and of the various short-lived motor omnibus companies which sprang up some few years ago, until the present combined attempt to provide the best possible transit facilities, proved exceedingly illuminating, for Mr. Mitchell's personal connection with the movement enabled him to quote from his own knowledge.

The second part of the paper dealt with the development of the various railway systems in London, commencing with the first appearance of trunk-line railways at a Metropolitan terminus, and the establishment of the Metropolitan, the District, and the various Tube lines, and the final conversion of the Underground Railways from the old days of dirt, smoke and sulphur, to the modern electrified working.

Tramways in London were dealt with in the third stage of the paper, and it described the ramifications of the various Council and Company undertakings now in operation. Statistics which were given, showed the enormous stimulus to the travelling habit which was given by the improvement of facilities, and the offering of transit at reasonable fares, and the whole paper formed an admirable survey of the history and development of transit in London.

The paper was followed by a film of the newly electrified portion of the London and South Western Railway, after which a discussion was opened by Mr. W. E. Blake, Superintendent of the Line of the Underground Railways, who, by means of five instructive charts, showed the manner in which these had developed within five defined periods, the curious inter-mingling of main-line railways with the Underground Railways becoming more apparent as each step was traced. Mr. J. P. Thomas, General Superintendent of the London General Omnibus Company, outlined a number of directions in which development in the future should take place, noticeably in connection with economy and scientific application of the use of coal and motor fuel.

Boiler Construction.

At a recent meeting of the Institution of Locomotive Engineers, Mr. Burnett invited the graduates present to make a note of some practical information in regard to boiler construction, and perhaps the following references would be useful to students:

The grate area of a boiler is regulated by the square of the diameter of the cylinders.

Take the square of the diameter of the cylinder and multiply it by a constant, .055. You get the grate area. For example, take 16 in. The square of 16 equals 256. Multiply that by .055 and you get 14,080. Cut off three places of decimals, and 14 sq. ft. is the proper grate area for a 16 in. cylinder. The total heating surface is 66 times the grate area, a good proportion for ordinary railway conditions. Six times the grate area for the firebox—14 by 6 equals 84 sq. ft. That will be the correct heating surface of the firebox, and 60 times 10 times more—that is, 840 sq. ft.—will be the area for the tubes. These, together, give 924 sq. ft. as the proper total heating surface for an engine with cylinders 16 in. in diameter.

Early Caledonian Engines.

In the course of a lengthy but welcome and illuminating letter on several subjects, Captain Chrystal remarks:

"I think Mr. Guthrie, in his query as to outside cylinder 4–4–0 engines, means the 'Ardrossan Bogies,' Nos. 125–9. I cannot say who designed them, but they were originally of the straight-funnelled type and must, in that state, have resembled the Adams engines on the

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London and South Western Railway. They were a very handsome lot, a superior edition of the 'Edinburgh' class of that time, which only differed from them, in general appearance, in that the latter lacked the leading bogie. I refer to the class of which 34, and sundry others up to 48, were members. There was also another similar series, numbered, I think, 117–22, which only differed from the 'Edinburgh' 2–4–0's by having the (Ramsbottom type) safety valve on the dome instead of in the normal position.

"These were all 7 ft. engines, and how they ever came to be employed on the most hilly sections of the line I cannot imagine. The last-mentioned lot, which I have put down as 117–22, were on the Perth-Aberdeen section, and I think one of them is 'mentioned in despatches' in the '88 race. I did not see any of them in the South until well on in the '90's, or possibly later.

"I cannot say which of these engines are now running; obviously, from the fact that modern types now bear their numbers, most of them have 'gone west,' or at least have a '1' in front of their original numbers. The same applies to the 473, etc., class mentioned by Mr. Niven; these had wheels about 5 ft. 6–9 in. and were quite different in appearance, being of a clumsier build and having closed splashers, whereas the 7 ft. engines all had perforated splashers.

"The modern drivers could make nothing of the 7 ft. engines, but the old school, who had been brought up on them, did wonders sometimes, especially, of course, on light trains. There was an old worthy called Bob Scott, who had No. 47 at Stirling in 1910, and his work on a certain Saturday night train to Edinburgh and back was very much talked about at the time, particularly over the Polmont–Haymarket West section, where it was a point of honour with all Caledonian drivers to lay all the North British records 'flat,' and averages of over 60 miles per hour were quite common. I have had many runs with Nos. 57 to 59 in my own experience, but never got behind old Scott, although I knew him very well in Stirling station."

Mr. Thornton on the War.

PRESIDING recently at a gathering of over 500 members of the American Luncheon Club at the Savoy, Mr. H. W. Thornton, the distinguished General Manager of the Great Eastern Railway, spoke of the future of the United States of America in the great war. Since Mr. Thornton gave expression to his feelings the United States have thrown in their lot with those European powers who are fighting for civilisation against Germanic Central Empires. Subsequent events have proved how correct Mr. Thornton was in his anticipations. They stood, he said, on the threshold of great events, and he thought the presence of so many distinguished Americans and Englishmen was significant, not only of the good relations which existed between the United States and England, but of a still closer and more glorious connection in the near future. Whatever might be the result of the rupture of the diplomatic relations between the United States and Germany, that fact at least emphatically announced to the world that Germany was henceforth debarred from association with civilised people. In the circumstances the only message they could send to President Wilson was that they awaited with quiet confidence that announcement which would protect the rights of American citizens on the high seas and avenge the murders of their countrymen. They who stood near the frontiers which Germany, by her action, had made the frontiers of civilisation, felt there could be no peace and no honour until the class which had precipitated this war had been exterminated. As he stood beneath the flags of Great Britain and the United States, he ventured to express the hope that the blood which England had shed in order that right and liberty should be maintained might be mingled with the blood of Americans.

Mr. Thornton is honorary Lieut.-Colonel of the Engineer and Railway Staff Corps and has recently been appointed Deputy Director of Inland Waterways and Docks. His portrait appears on page 361.

How a Railway Saves on Waste Material.

CAREFUL attention is paid on the Grand Trunk Railway system of Canada to the work of salvaging the many tons of discarded material produced on a railway operating many thousands of miles of line. Central scrap yards have been established, where the sorting of this material is carried out. Forty thousand tons of scrap are examined each year and this work is done under expert supervision, so that full value is obtained for the metal and other commodities sold, while a large amount of material is reclaimed and returned for use. The Grand Trunk buys each year approximately one million dollars worth of brass. This great mass of metal shrinks in value by usage, but every pound that can be possibly salvaged is returned to the foundry and has a high cash value. Rails with battered ends are re-sawed, used bolts are re-threaded and the couplings of air-brake, signal and steam heat hose are repaired. The Grand Trunk has in actual use each day about 85,000 pieces of air and steam hose, representing, with the necessary fittings, an investment of $200,000. The perishable part of the hose must be replaced at frequent intervals, but under the system of reclamation the various couplings are used over and over again. It has been demonstrated that the value of good material rescued from scrap amounts to about two dollars per ton, while proper sorting and classifying increases the net selling value of the scrap by another two dollars per ton, the saving thus made amounting to a large sum of money when tens of thousands of tons of material are handled.

A Popular Peninsula.

RESIDENTIAL travellers on the Wirral Railway have many reasons for holding in high esteem the capable control of the railway working by the Traffic Manager, Mr. J. H. Burns, while the shareholders have good cause to congratulate themselves on the resultant growth of the

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railway's revenues. Dealing at the annual general meeting with the Company's financial position and prospects, the Chairman, Mr. T. H. Jackson, requested the proprietors to contrast the receipts for 1916, which were £79,421, against £74,820 in 1915; and, added he, when you compare these figures you will see how satisfactorily our business has improved. The figures I have given do not contain the conveyance of the Forces by passenger train travelling free under Government permits, or traffic conveyed under warrant for the Army or Navy, which would represent a large sum if taken into our accounts. Those of you who have taken an interest in the statistics which it has been my duty to put before you from time to time, will have observed how steadily the revenue of the Company has progressed. That is the best evidence you could have of the stability of our business, and of the fact that residence on the Peninsula is increasingly attractive. There is no reason to suppose that when this terrible war is over there will be any check to this progress, and your Directors are confident that the future will not disappoint you. From causes which are beyond our control, it became imperative that a reduction in the passenger train service must be effected, but the consideration given to the requirements of our patrons has resulted in very little disadvantage. Our passengers on the whole have taken the change uncomplainingly, recognising that we always feel a repugnance to interfering with our established service.

Trips to Alaska.

ANNOUNCEMENTS concerning tourist trips come as a surprise to European readers who have the great war always in mind, but the western coasts of North America are a long way from the scenes of conflict, and as was the case last summer, the Canadian Pacific Railway steamship *Princess Charlotte* will make three round trips in the Alaska tourist service this year, which becomes effective June 8th, 1917. The list of tourist sailings between Victoria, Vancouver, and Skagway, which has just been announced by the B.C. Coast Service, provides for three round trip sailings for the *Princess Charlotte*, seven for the *Princess Alice*, and seven for the *Princess Sophia*, making 17 round trip sailings all told for the summer season of 1917. The advent of the palatial steamship *Princess Charlotte* in the Alaskan tourist trade last year was such a pronounced success that the company had no alternative but to arrange for her return to the northern run this year, when it is expected tourist travel north will break all records. The schedule has been arranged earlier with a view to giving plenty of time for the arrangement of advance bookings.

The company proposes making a feature of this delightful travel route, and specially illustrated and descriptive literature is being prepared for distribution all over the North American continent. The accommodation on the *Princess Charlotte* will be largely reserved for parties booking in the East. A large number of inquiries regarding the northern tours have already been made in the East by parties who were unable to take the trip last summer.

Canine Railways.

WHEN the transport of army supplies through the snow in the Vosges was of urgent importance, the French authorities conceived the idea of using dog-drawn sleighs, and several hundred trained animals from Alaska, North-Western Canada and Labrador were obtained. With the end of the snow, according to a British press representative with the French Army, the dogs continue to be found useful work. They are now being harnessed to small 2 ft. gauge light railways, which run everywhere behind the front, and they are capable of drawing the heaviest load up the steepest gradient. Eleven dogs, with a couple of men, can haul a load of a ton up some of the most precipitous slopes in the mountains, and the writer states he is assured that two teams of seven dogs each could do the work of five horses in this difficult country with a very great economy of men. Of the three breeds in service the best is the Alaskian. His courage never fails, and he will work until he drops, though he is perhaps the weakest of them all. Their chest development, so necessary for hauling, is remarkable. They are mainly fed on rice, horse flesh, and waste military biscuits.

Successful Electrifications.

VERY satisfactory is the result of the working of the electrified portion of the suburban lines of the London and South Western Railway. It has exceeded the most sanguine anticipation. The first section that was converted from steam to electricity, the Kingston roundabout line, was brought into use on January 30th, 1916. That was followed by the Hounslow loop line on March 12th, by the Hampton Court line on June 18th, and the final section to Claygate on November 20th last. During the last six months of the year the number of local passengers carried, including season ticket holders, showed an increase of no less than 4,086,328, or, including Sundays, an average increase of 22,208 passengers per diem. Of course, the Company were hit rather hard at first by not being able to get the necessary machinery, and were thus not able to put the full number of trains into use, but that has been gradually rectified. Dealing with the whole of the year, the increased revenue for local passengers in the electrified area was £77,000. The additional maintenance and working expenses due to electrification were £120,000, and the saving in locomotive expenses owing to the discontinuance of steam trains was £73,000. In the first year of electrification there has, therefore, been secured a profit of £30,000 after charging revenue with the necessary amount to provide for the replacement of the electrification machinery and equipment when such becomes due.

Successful results are likewise recorded in connection with the electric working of the Shildon and Newport section of the North

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Eastern Railway. At the annual general meeting of the proprietors, Lord Knaresborough, the Chairman, referring to a sum of £100,000 now debited to capital in respect of this electrification scheme, explained that "in order to work satisfactorily, and we hoped more economically, the heavy mineral traffic passing between these points, we decided to electrify some 18 miles of line at a cost of about £150,000. In the accounts for the year 1913 we put this sum into suspense out of revenue, and in speaking on the accounts for that year, I explained that the Directors preferred not to make any charge to capital until they had had some experience of the working of the scheme, which was to some extent in the nature of an experiment, being the first instance in this country of carrying goods and mineral traffic on any large scale by electricity. We have now had experience of the working for more than a year, and although the accounts for the cost of construction are not yet complete, we are satisfied that the venture will justify a charge of £100,000 against capital."

Future Activities of the North British Railway.

It is generally recognised that after the war British railways will not return to exactly pre-war conditions, but just what the new state of affairs will be no one, among those really capable of judging, will at the moment venture to predict. Quite recently Mr. William Whitelaw, Chairman, North British Railway, speaking on the subject, remarked that while it was true that there would probably be great changes in the position of railway companies after the war, they had not certain information on the matter, and they must be prepared for ultimately resuming in full their responsibilities to the public. He was unable to speak as freely as he should like about some of the aims and developments of industrial life of the North British Railway system, but they were giving constant attention to them. Obviously, the provision of goods and passenger stations, shunting yards, and sidings must involve considerable capital expenditure. To foresee exactly where and how that expenditure ought to be incurred was no easy task. The Highland gift of second-sight would be invaluable to them just now; but short of that a strong Scottish blend of enterprise and prudence was what they must depend upon. The task was the more difficult in that, to a large extent, they had to adapt existing lines and works to new and undreamed-of conditions, and they had not got a virgin field to work upon. If they received the continuous and sympathetic confidence of the shareholders, he believed they would succeed in finding solutions to all their problems, which would satisfy the public interest, and be not unprofitable to the Company.

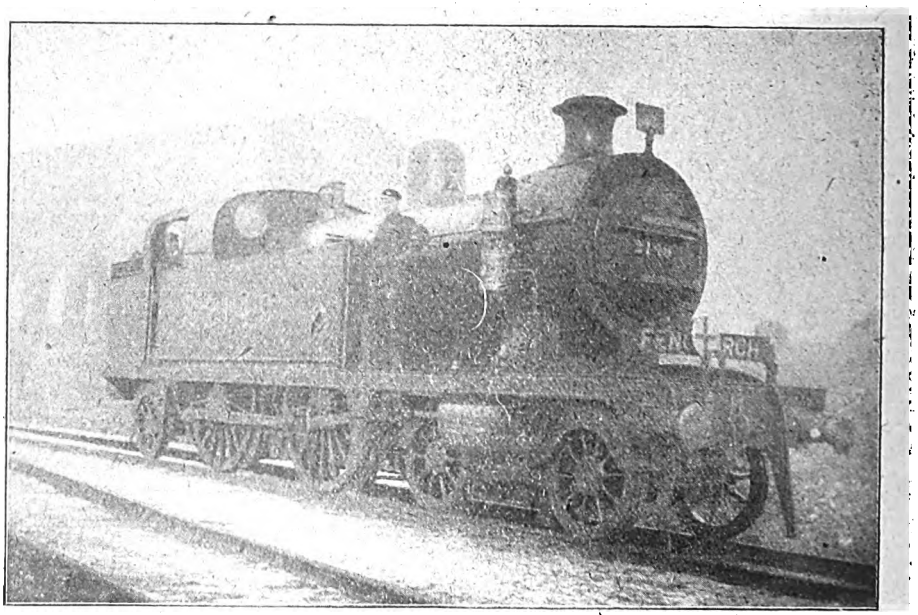

Photo [*C. Cowshall.*

MIDLAND RAILWAY (LONDON, TILBURY AND SOUTHEND SECTION) 4-4-2 TANK ENGINE, NO. 2149.
Driver, Herbert Collins. Fireman, Tom Tracy.

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WHAT THE RAILWAYS ARE DOING

COLONEL C. S. DENNISS, General Manager of the Cardiff Railway, has tendered his resignation, and by an arrangement come to between the Cardiff Railway and the Rhymney Railway, Mr. E. A. Prosser, General Manager of the Rhymney Railway, becomes Manager for both companies. Mr. Prosser is a native of Cardiff, and was educated privately in mid-Wales and near London. He began life in a shipbroker's office at the docks, but the iron road had more attractions for him than shipbroking, and in 1881 he secured a junior clerkship on the Rhymney Railway. He went through all departments, with the result that he possesses a practical knowledge of goods management, traffic superintendence, and a general acquaintance with railway engineering. For five years prior to his appointment as General Manager of the Rhymney Railway, in 1905, he was Deputy-Manager to the late Mr. Cornelius Lundie, who for many years had held the triple position of General Manager, Engineer, and Locomotive Superintendent. In Parliamentary work he has proved himself a capable witness, and in the fights of a few years ago proved himself a match for many of the older Parliamentarians. Under the Rates and Charges Order Act of 1892 Mr. Prosser had charge of the revision of the railway companies' charges, and his appointment to his present position proves that his abilities are highly valued. An illustrated interview with Mr. Prosser appeared in the RAILWAY MAGAZINE, January, 1910.

MR. E. A. PROSSER.
Appointed Manager of the Cardiff-Rhymney Railways.

* * *

A NOTABLE figure in British railway affairs has passed away by the death, at his seat in Cumberland, of Lord Muncaster, Chairman of the Furness Railway. He was in his 83rd year, and until recently had taken an active part in county matters, and was often to be seen walking in the neighbourhood of Muncaster and Ravenglass. He was the fifth Baron of the Irish creation of 1783, and for 15 years sat for Cumberland Divisions in the House of Commons, being promoted to a Peerage of the United Kingdom in 1898. Since 1876 he had been Lord Lieutenant of Cumberland, and at one time possessed estates in the East Riding of Yorkshire, as well as those in Cumberland and in Lancashire. He was an honorary Colonel of Cumberland volunteers, formerly Colonel of the East Yorks. Militia, and some time a Lieutenant in the Yorkshire Hussars. A portrait and biography of Lord Muncaster was given in the RAILWAY MAGAZINE, July, 1913. He was then Deputy Chairman. Lord Muncaster followed the Duke of Devonshire as Chairman when the latter vacated the position to succeed the Duke of Connaught in Canada.

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AMONGST those present at the funeral of the late Lord Muncaster were the following representatives of the Furness Railway:—Mr. F. J. Ramsden, Deputy Chairman; Mr. Myles Kennedy, Director; Mr. Alfred Aslett, Secretary and General Manager; Mr. W. F. Pettigrew, Locomotive Superintendent; Mr. D. L. Rutherford, Engineer; Mr. A. A. Haynes, Superintendent of the Line; Mr. R. F. Miller, Auditor.

* * *

A CAPABLE railway chairman was Lord Allerton, who has recently died. He was a director of the Great Northern Railway from 1883 and Chairman of the Board of Directors since 1895. He was made a peer in 1902, having represented one of the divisions of Leeds from 1880.

* * *

MR. OSBORN J. MYTTON has just retired from the accountantship of the Belfast and County Down Railway, a position which he has occupied during a period of 25 years. Mr. Mytton gained his preparatory experience in the Accountant's Office of the South Eastern Railway, and is a brother of the Accountant of that Company, Mr. N. Mytton. At the last annual meeting of the Belfast and County Down Railway, the Chairman

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MR. SAMUEL BOWER.
Accountant, Midland Railway.

referred to the efficiency with which the work of Mr. Mytton's department has been conducted, and we are informed that the Directors have recently marked in a generous manner their appreciation of his services. At a special gathering at Queen's Quay on the occasion of his retirement Mr. Mytton was the recipient of a handsome present from the officers and staff in token of the esteem in which he was held by them. Mr. William Moorehead, who has had many years' experience in the service, has been appointed Mr. Mytton's successor.

* * *

LIEUT. F. G. ENGLISH, Essex Regiment, first reported missing in November last through the Netherland Red Cross Society, is now reported killed. Mr. Fred C. Salter, European Traffic Manager of the Grand Trunk Railway of Canada, writes: "Mr. English joined the Company 11 years ago. Step by step he rose to the office of general agent of the freight and express department of the European organisation. By his loyal and intelligent work and kindly manner, he gained the full confidence of all officials, as well as of all those who knew him throughout Europe and North America. At the outbreak of war he volunteered as a private. He has give up his life that liberty, fraternity, and equality shall grow stronger among the people of Europe. His memory brightens our path of life and cheers us on."

* * *

MR. HOWARD WILLIAMS, Mineral Manager of the London and North Western Railway, has been appointed by the Minister of Munitions as Deputy Director General. He joined the staff of the Ministry in September, 1915, for the purpose of organising a department to deal with railway transport matters, and on the transfer of General Wedgwood to the staff of the Director General of Military Railways in October, 1916, was appointed Director of Munitions Railway Transport. Mr. Howard Williams was the subject of the "Railway Portrait Gallery" in the RAILWAY MAGAZINE, September, 1915.

* * *

MR. SAMUEL BOWER has been appointed Accountant of the Midland Railway in the place of the late Mr. Walter Bailey. Mr. Bower entered the service in 1869. In March, 1905, he became Assistant Accountant in succession to the present Mineral Manager, Mr. A. W. Allen.

* * *

A NUMBER of changes in connection with the appointments of Stationmasters has been made on the Caledonian Railway. Mr. D. Paton, Princes Street station, Edinburgh, has joined the staff of the Superintendent of the Line, Glasgow, to take charge of the Time-Table and the Advertising Department.

Photo [*Lafayette.*
MR. D. PATON.
Appointed to take charge of the Time-Table and Advertising Department, Caledonian Railway.

IN connection with the Supplementary Pension Society of the London and South Western Railway employés it is proposed to raise a memorial to the late Mr. Ness Wilson, the founder of the Society, to whose foresight and energy its present prosperity is largely due. Mr. Wilson was for many years one of the most notable members of the uniformed staff in the British railway service, with a reputation far beyond the limits of the railway he served so faithfully. Possessed of considerable literary ability, he was a frequent contributor to the press, including the RAILWAY MAGAZINE.

* * *

NOWHERE in the railway world is a "real good fellow" better appreciated than at Euston.

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Evidence of this was to the fore on a recent evening, when a large and representative gathering of the London and North Western (London) Athletic Club and its various sections gathered together in the Euston Dining Club to say goodbye to the General Secretary, Mr. D. H. F. Meacock, who has recently joined the Colours. The occasion was made the opportunity for making a presentation to Mr. Meacock of a luminous wrist watch and a gold curb bracelet to Mrs. Meacock. In making the presentation, Mr. Cecil F. Grasemann commented on the excellent work done by Mr. Meacock for the company and its staff, both at work and play; he said that everyone would agree that Mr. Meacock had both worked hard and played hard. Mr. A. C. Harris, of the General Manager's Department, followed with a clever and witty speech, confirming all Mr. Grasemann had said; he added that he was very glad to give testimony to the good work carried out by the General Secretary of the Club during his term of office. Mr. Meacock then replied and thanked Mr. Grasemann and the members for their gift to him and to Mrs. Meacock and for the support which had been accorded him while he had been in office.

* * *

We record with deep regret that Mr. Philip F. Groves, who was a valued occasional contributor of articles to the Railway Magazine, has died in a military hospital in France. He was in the Royal Engineers and attached to the Army Docks Department as interpreter. His very promising career has terminated at an early age, and much sympathy is accorded his bereaved parents and friends.

* * *

It will be good news for the many admirers of his world-famous railway train photographs that, after a lengthy experience of trench warfare in France—much of it of a very exciting and sanguinary character—the Railway Magazine photographer, Mr. F. E. Mackay, is back in Great Britain and is now serving his country in a special way for which his pre-war career has admirably fitted him.

* * *

In the House of Commons recently the Chief Secretary for Ireland was asked whether he was aware that owing to bad management of the Cavan and Leitrim Light Railway the ratepayers in the Leitrim portion of the guaranteeing area were called on to pay a deficit rate of 1s. 6d. in the £; whether he was aware that this line was being run in conjunction with the Arigna Coal Mining Company, and that if this mine were developed it would not only tend to reduce the burden on the ratepayer but be a source of revenue to the shareholders and a boon to Ireland and the Empire; and whether he would recommend a Treasury grant towards the developing of this mine. In reply Mr. Duke remarked: I am informed that the poundage rate levied in respect of the working of the Cavan and Leitrim Light Railway for 1916 is somewhat less than that mentioned by the hon. member. The working charges have been necessarily increasing in recent years, as on all railways. The Commissioners of Public Works are not aware that the line is being run in conjunction with the Arigna Mining Company, though out of 14 directors of the railway (of whom six are appointed by the County Council) three are also directors of the mining company. I am not aware of any exceptional circumstances which would warrant a grant from the Treasury.

* * *

A Parliamentary question addressed to the Postmaster-General whether he would state the result of his negotiations with the Great Southern and Western Railway with reference to expediting the transit of the mails between Amiens Street and Kingsbridge, drew from Mr. Illingworth the following reply: I understand that the object of the hon. member is to obtain an earlier arrival at Cork of the train which brings the incoming night mails from Holyhead *viâ* Kingstown, Amiens Street and Kingsbridge. After communicating with all the railways concerned, I am assured that this object cannot be attained without incurring additional cost which would be unjustifiable, especially in present circumstances. The omission of the stop at Westland Row has been suggested in order to save time between Kingstown and Kingsbridge, but that would retard the delivery of letters in some important Dublin districts.

* * *

Attention was called recently to the rich veins of iron ore in Warwickshire on the north side of Edgehill by the Stratford-upon-Avon and Midland Junction Railway. There are said to be upwards of 30 million tons of easily workable ore, and analysis has yielded on an average 30 per cent. of iron. It was urged that the neglect of so much mineral wealth at this time was worse than folly. A scheme is now on foot which will obviate the reproach. A railway is proposed, at an estimated cost of £20,000, to connect the projected workings with the Stratford-upon-Avon and Midland Junction Railway.

* * *

In regard to accidents so its servants the Great Western Railway's statistics show up to 1913 an almost invariable tendency towards increase. In 1914, however, this tendency was arrested, and whereas in 1913 the increase was 11·2 per cent., in 1914 this was converted into a decrease of 3·7 per cent., and in 1915 and 1916 to further decreases of 16·2 and 10·9 per cent. respectively. It is claimed that this improvement may be associated with the initiation by the company in 1913 of the "Safety First" movement. Early in 1914 an illustrated booklet on the prevention of accidents was distributed to each of the 80,000 employés, and pocket tokens have also been supplied to keep them in mind of the "Safety First" campaign.

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Many jurymen compelled to journey considerable distances at their own expense to attend assizes consider it a hardship that they should have to pay the prevailing 50 per cent. increase on railway fares, just the same as though

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they were travelling for their own business or pleasure, but the Board of Trade, on consideration, has decided that it is not practicable to make a concession in their favour.

* * *

CANCELLED is the order that passengers in British railway carriages which are provided with blinds must keep them lowered at night so as to cover the windows. The lights in the carriages will now be extinguished in case of a threatened attack by hostile aircraft and thereafter no lights may be exhibited by the passengers.

* * *

AT the annual meeting of the depositors of the Taff Vale Railway's Savings Bank, Mr. T. A. Walker, the Secretary of the Company, presided, and in moving the adoption of the report said that the position, as revealed by the balance-sheet, was highly satisfactory. The deposits received during 1916 amounted to £5,639 15s. 6d., and the withdrawals to £4,353 3s. 4d. Interest had accrued to the extent of £1,187 8s. 3d., leaving a balance standing to the credit of the depositors on December 31st, 1916, of £35,583 8s. 8d., an increase of £2,474 compared with 1915. Having regard to the war, increased withdrawals and a diminished balance-sheet might have been expected instead of this progress. The number of accounts had increased to 696, and the amount deposited during the year had only been exceeded on four occasions in the 22 years of the bank's existence. Mr. Walker further said the bank had enabled depositors to assist in winning the war, inasmuch as £5,000 was withdrawn this year for investment in the War Loan.

* * *

As announced in the April RAILWAY MAGAZINE the new line to Mansfield with stations at Kirkby-in-Ashfield and Sutton-in-Ashfield were opened for passenger traffic on April 2nd. The line commences at Kirkby by a junction with the Great Central main line to London, and terminates at Clipstone on that Company's Chesterfield and Lincoln branch. The Great Central Railway has entered into an agreement to work and maintain the line at 60 per cent. of its gross receipts. A minimum traffic of 500,000 tons of coal annually has also been guaranteed by the Bolsover Colliery from its Mansfield and Rufford pits to Grimsby and Immingham, and the Great Central Railway has agreed to make best endeavours to fairly and efficiently develop and use the line for the purpose of through traffic between Lincolnshire, London, and the Southern Counties. The new railway shortens the distance between London and Grimsby by about 5 miles, and thus constitutes an improved route for the Great Central Railway's fish, goods, and other traffic between Grimsby, London, and the South, and also for passenger traffic between London (Marylebone) and Grimsby.

* * *

DURING 1916 there was an increase of nearly £3,000 in the passenger receipts of the Isle of Man Railway. This is accounted for by the increased number of tourists carried during the summer, also to the movement of troops and aliens. Parcels and goods traffic both showed a considerable increase during the year.

* * *

HELD on April 10th, under the presidency of Mr. H. W. Bardsley, when two recruits were elected, the members of the Railway Club, 92, Victoria Street, London, S.W., at their last monthly meeting were favoured by Mr. C. H. Palmer reading a paper entitled "Single Line Working on British Railways." The lecturer freely supplemented his remarks with photographs and drawings, and described the various forms of signalling and block working as installed on British railways, attention being drawn to the sections installed with the several forms of apparatus. Some notice was also paid to certain foreign forms of block working, the necessary material for which was made and erected by British firms.

* * *

ANOTHER visit was made to Parkeston Quay on April 10th by the orchestra of the Great Eastern Railway Musical Society, when a concert was given to the submarine sailors. The large hall was packed to overflowing and the greatest enthusiasm prevailed. It was evident that the news of the society's visit had caused a great deal of pleasurable anticipation, and Colonel William Johnson Galloway, the honorary conductor, and the members were given a most hearty reception.

* * *

A SITE has been chosen in Cyfartha Park, Merthyr, for a statue of Richard Trevethick, the Cornish inventor of the famous "Trevethick's high-pressure tram engine," the trial run of which took place in the town in 1804. Lord Rhondda of Llanwern is presenting Merthyr with the memorial.

* * *

To deal with the enormous extra traffic brought about by the abnormal conditions prevailing consequent upon the War the Highland Railway has had 25 engines on loan from other railways.

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FROM Dartford, Mr. A. E. Edwards, junr., kindly communicates: "I noticed in the January RAILWAY MAGAZINE a list of the sheds of some of Mr. Wainwright's South Eastern and Chatham Railway 4–4–0 superheater express engines. I am now able to send you a complete list, taken from the works numbers inside the cabs.

Shed No.	Shed.	Engine Nos.
2.	Bricklayer's Arms..	772, 775, 776, 777.
3.	Cannon Street ..	760, 763, 765, 771, 773, 781.
5.	Tonbridge ..	769, 770.
12.	Hastings	*764, 768, 774, 779, 780.
13.	Ramsgate Town ..	762, 766, 767.
19.	Folkestone ..	761, 778.

* No. 764 was at Ramsgate Town until a few months ago.

"I also observed," adds Mr. Edwards, "on

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page 300, of the April number, that some of the South Eastern and Chatham Railway tank engines are working on the Great Western Railway; could some RAILWAY MAGAZINE reader please tell me the numbers of these engines ?"

* * *

IN a subsequent letter Mr. Edwards observes that it may interest RAILWAY MAGAZINE readers to know that the following Stirling 4–4–0 express engines (South Eastern and Chatham Railway) have been rebuilt with extended smokeboxes: Nos. 9, 62, 143, 452, 457. They have all been painted black with large numbers on tender.

* * *

MR. MALCOLM M. NIVEN writes that of the 16 Glasgow and South Western Railway 4–4–0 engines by the late Mr. James Stirling, which were renumbered 191 to 206, No. 205 is now stationed at Ayr, and 206 at Ardrossan. All the others are at Hurlford (Kilmarnock) shed. They are daily at work.

* * *

FROM Mr. James McNaughton the RAILWAY MAGAZINE has received a photograph, which, unfortunately, cannot be reproduced, of Caledonian Railway express engine, No. 125, built in 1877, re-built 1887 and broken up in 1906. This, says Mr. McNaughton, was one of five locomotives of the same class, built by Messrs. Neilson & Co., to the designs of the late Mr. Benjamin Conner, Locomotive Superintendent. They were known as the "Dundee bogies," having been stationed at Dundee for many years. These engines were quite distinct from the old Oban bogies and were numbered 125 to 129 inclusive. The last to survive was No. 126. This engine spent the last years of service as No. 1126, running local and express traffic between Perth and Dundee West, being broken up in January, 1910.

* * *

MR. J. W. B. TUNSTALL seeks from fellow RAILWAY MAGAZINE readers the following information:—(1) Can any of you say whether the London and North Western Railway "single," *Cornwall*, is still running? To my knowledge it has not been included in the official lists for a considerable time, although I saw it in Huddersfield station with an engineer's saloon about three years ago. (2) Are any facts available concerning the Midland 2–6–2 tender engine, as, for instance, what work it does and where it is stationed?

* * *

AN appreciative Bristol reader (J. N. F.) in the course of a courteous communication remarks: "In connection with the photograph of Great Western Railway engine No. 2140, which appeared in the March RAILWAY MAGAZINE, some of your readers may like to know that this locomotive is now fitted with 'pannier' tanks and the usual style of cab. Also, the boiler is domed. The engine has for some time been working in the Bristol district on the auto-trains used on the Clifton Down and Avonmouth line."

IN the progress of an entertaining letter, for which lack of space prevents complete quotation, Mr. V. Judd, Ash, Surrey, writes:—"The South Eastern and Chatham Railway line from Ash to Aldershot has for a long time been worked by an auto-train composed of 4 or 6 (as desired) six-wheeled coaches and 0–4–4 tank locomotive fitted with condensing apparatus. The London and South Western Railway have now, I hear, a 'pull and push' locomotive at Guildford, a 0–4–4 tank No. 238. The South Eastern and Chatham Railway 0–6–0 tank known then as the *Teddy Bear*, which at one time worked the Aldershot local service, is now doing good work in Salonica."

* * *

FROM a military camp at Winchester, Private W. Cooke has written concerning the locomotives in use on the lines serving the district. He is anxious to get in touch with other RAILWAY MAGAZINE readers in Winchester, and we shall be pleased to do what we can to assist him if other readers there resident will write to us.

* * *

"ANGLO-SCOT" asks if any RAILWAY MAGAZINE reader can inform him (1) where was the original junction between Leeds and Thirsk and the Leeds and Bradford Railways. Was it at Leeds and Thirsk Junction or Wortley Junction? (2) When was the joint North Eastern and Great Northern line between Wortley and Holbeck Junction opened?

* * *

FROM the report of the Imperial Government Railways of Japan for 1915, which recently reached the RAILWAY MAGAZINE, we learn that, with a view to creating a railway museum, as referred to in the preceding reports, efforts were made for completing the collection of railway appliances and objects of interest in general. The number of exhibits got together during the year under review totalled 121, including the Imperial hearse carriage and the hearse used for the funeral of the Empress Dowager, miniatures of the main buildings of new Tokyo and Shimbashi stations, a miniature of the hump yard at Tabata station, a miniature of the loop line of the Kagoshima main line, a miniature of the Amarube bridge, San-in line, miniature passenger and freight locomotives, a miniature passenger carriage, miniature ferry steamers *Koma-maru* and *Shiragi-maru*, a miniature of the Yalu bridge, a miniature coal loading machine, a sleeping berth, etc.

* * *

IN Japan the present railway gauge is 3 ft. 6 in., which was the system adopted when the first railway was built in the land of the rising sun. A change is desired, especially in the interest of a greater development of commerce and industry. The task is a large one, and it is planned to inaugurate the work by widening the gauge on the main trunk line connecting Tokio with Shimonoseki, which are 800 miles apart. This is the line which connects with Corea and the Siberian Railway.

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Railway Literature.

RAILWAY YEAR BOOK, 1917. [London: Railway Publishing Company, Ltd., 30, Fetter Lane, London, E.C.4. Cloth, 2s. 6d. net; by post, 2s. 11d.; abroad, 3s.] For the 20th successive year the publishers of the "Railway Year Book" have produced a new edition. So firmly has the book become established as the standard railway reference work, that to many of its annual subscribers engaged in railway work and administration, in engineering affairs and in commercial pursuits, a notice in the RAILWAY MAGAZINE may seem superfluous, but in accordance with custom, the usual announcement of the Year Book's advent is hereby given. Although the British Empire and its Allies are still engaged—for the third year—in a world-wide war, and the publishers, as a consequence, have experienced some little difficulty in the production of this new edition, on examination it will be found that not only does the book include the numerous valuable features of other years, but new ones have been embodied which it is anticipated will meet with similar appreciation. Among the innovations may be mentioned a table dealing with the largest railway stations in Great Britain and a map showing how the London theatres are served by the Underground Electric Railways. As in the edition for 1916, the fullest possible information is given concerning British railway relations with the State, the *personnel* of the British Railway Executive Committee, numbers of railwaymen serving in the Armed Forces of the Crown, and other railway arrangements rendered necessary by the prevailing state of war. All this material has been brought up-to-date and supplemented by the latest facts and figures obtainable. Particulars relating to the control of Irish railways by the Government and the establishment of an Irish Railway Executive Committee have been properly recorded. Statistical information is as full as the present times will permit, and where in some instances details formerly given are now, in war time, absent, the reasons are too obvious to need recapitulation. In Government, newspaper, and other offices, the railway officers' "Who's Who" in the "Railway Year Book" is in frequent request, and this has particularly been the case during the past year, when so many leading railway officials have been taken by the State for important Government work at home and abroad. This portion of the book has been carefully revised and many additional biographies of officers who during the past twelve months have advanced to leading positions in the railway world have been included. As in previous years, those engaged in the production of the "Railway Year Book" have enjoyed the cordial co-operation of the principal railway officers, and their valuable and courteous assistance is acknowledged by the Editor.

* * *

LOCOMOTIVE ENGINEER'S POCKET BOOK AND DIARY, 1917. [London: Locomotive Publishing Company, Ltd., 3, Amen Corner, Paternoster Row, E.C. pp. 340. Leather, 2s. 6d.] The current issue of this well-known annual publication is, in spite of the times, an improvement on its already excellent predecessors. It fulfils a distinct want and may be regarded as something rather more than its name implies, being, practically speaking, a text-book for the locomotive engineer. The statistical information relating to locomotive types and designs is supplemented by a large amount of data, formulæ, etc., relative to the more theoretical side of locomotive engineering. This compact publication will go easily into the pocket and may be carried without inconvenience for ready reference.

* * *

THE BRITISH DOMINIONS YEAR BOOK, 1917. Edited by Edward Salmon, F.R.C.I., and James Worsfold, F.C.I.S. [The British Dominions General Insurance Company, Limited, Royal Exchange Avenue, London, E.C.] This work was reviewed in March RAILWAY MAGAZINE. Since then the publishers have written informing us that the book is a complimentary one and is not for sale. They present it to their friends and clients who they think are interested in such a publication. In common with their previous Year Book, it has a wide circulation, and appears to be appreciated by those into whose hands it comes

* * *

LONDON AND NORTH WESTERN GAZETTE. [Euston Station, London, N.W.] In August, 1916, this excellently conducted periodical advanced its price from one penny to twopence per copy without the curtailment of the whole-hearted support of its readers. Owing to the increase in the cost of production largely by reason of the price of paper, commencing with the issue for May, 1917, those responsible for the publication have made the price of the periodical twopence-halfpenny per copy. This, it is hoped, will enable the publishers to continue the production of the *Gazette* until the end of the year, when it is expected some of the difficulties with regard to the manufacture of paper will have been overcome.

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MIDLAND RAILWAY (Northern Counties Committee) 4-4-0 locomotive, No. 70.

Fitted with Superheater and Walschaert valve gear.

B. Malcolm, M.Inst.C.E., Locomotive Engineer, Belfast.

Cylinders: 19 in. by 24 in. Coupled wheels: 6 ft. diameter. Bogie wheels: 3 ft. diameter. Steam pressure: 170 lbs. per sq. in.
Wheel base: Engine and tender, 40 ft. 11 in. Total length over buffers, 49 ft. 7¾ in.
Total weight of engine and tender in working order, 76½ tons.

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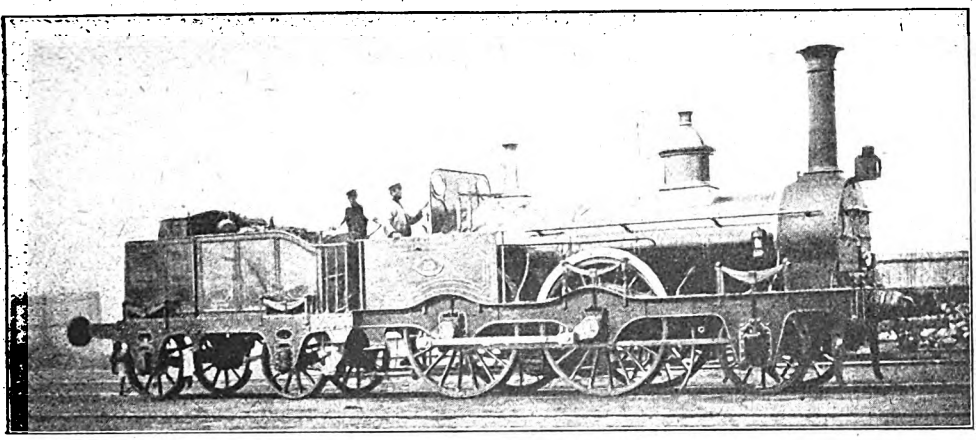

SOUTH EASTERN RAILWAY.
No. 19, old 2-4-0 passenger engine. Wheels, 5 ft. 6 in. Cylinders, 15 in. by 20 in.

Locomotive and Train Working in the latter part of the 19th Century.

SOUTH EASTERN RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE South Eastern of twenty-five to thirty-five years ago was a railway combining a number of good features with many exceedingly bad ones, and at one time, in company with its younger "Chatham" brother and rival, was held in the estimation of the local travelling public to be——here the reader had better perhaps choose his own adjectives, of which a choice and lurid selection was at one time to be obtained from most regular passengers on the line, except those connected with the churches. However, most of its sins were shared in common with other railways to the south of London.

It is easy to give a dog a bad name and then hang him, and so before proceeding with the execution of the South Eastern animal, I think it but just and fair to quote certain passages from Acworth's "Railways of England" and Foxwell's "Express Trains" (1888). Both authorities give the lights and shades from an unbiassed point of view. Acworth wrote:—"The truth is that, apart from the question of fares, there is little of which passengers can complain in the Continental service. . . . So long as English people have the good sense to maintain their freedom by arriving at a station at the last moment with a cab-load of luggage, delays must happen. But habitual unpunctuality is another matter, and there are too many trains in the South of England which only exceptionally perform their work within the time allotted to them in the time-table. Probably, however, the actual amount of unpunctuality is not so great as is commonly supposed. . . . One morning I saw quite accidentally a table of the working of all the up trains into London Bridge between 8 and 11 a.m. on the previous five days, that is, of course, at the most crowded time of the day. No train had been more than 6 min. late, very few were more than 2 or 3, while the great majority were up to time. No doubt there may have been delays afterwards getting into Cannon Street. In all England there is perhaps no more difficult piece of traffic to work. From the nature of things, trains going into Cannon Street from London Bridge must cross the path of trains coming out to go to Charing Cross or vice versa, and it is impossible but that this should cause a difficulty. Add to this the fact that the sides of the triangle on the Surrey side of Cannon Street bridge are so short that an empty carriage train from Charing Cross to London Bridge direct may

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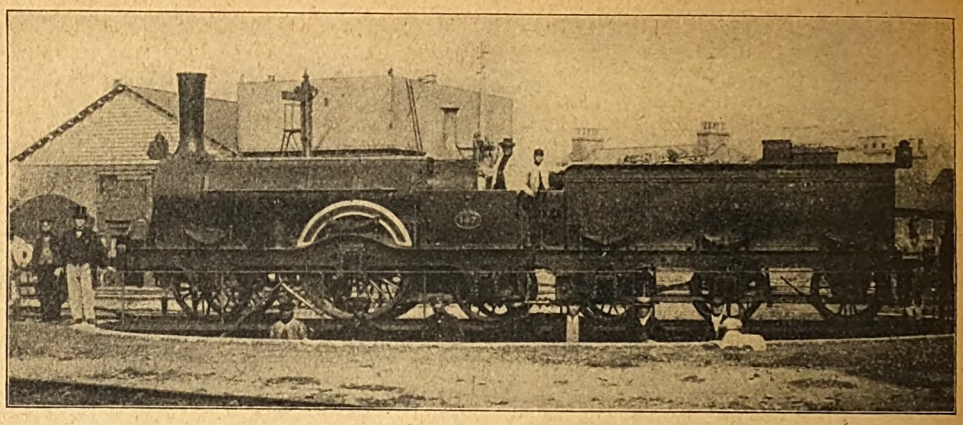

Photo] [*Locomotive Publishing Co., Ltd.*

NO. 147 (SERIES 144–151), 6 FT. SINGLE EXPRESS ENGINE.
Cylinders, 15 in. by 22 in. Built by Sharp Bros. & Co., 1851.

quite well block both the entrance to and the exit from Cannon Street entirely, and the further fact that for all its immense traffic the South Eastern has practically only one down line, and then no one need wonder that there are delays at Cannon Street."

Foxwell wrote :—"The 'Continental' trains show a very fine performance as regards *speed*, for the gradients between London and Tonbridge Junction are very severe. The same remark applies to the Hastings expresses, whose route is much harder again. And all these are heavy trains. The third-class carriages on the Ramsgate and Hastings trains are more roomy than the average in England. The passenger communication with the guard is far superior to that mockery provided on our great lines to the North. But the South Eastern is audaciously unpunctual, but so are all its three Southern neighbours. Its express trains (with one or two exceptions due to competition) will not look at third-class passengers. . . . Its fares are enormous for first and second-class. . . . Much of the public odium which attaches to the South Eastern is equally due elsewhere, but also most of it is founded on concrete fact. As regards express speed, this line is a subject for praise ; its expresses, few in number as they are, and mostly limited to first and second-class, are distinctly brilliant examples, and those to Hastings, which are third-class, and travel over one of the hardest routes in England, are as much to be praised as any anywhere."

Generally speaking the above are fair and honest comments. It used to be said that Northerners would not have put up with railways of the Southern type for six months, but this statement is not correct. For the old Lancashire and Yorkshire down to about 1880 could in many respects give the South Eastern points, especially in regard to unpunctuality. Its carriages were generally somewhat better, but as far as locomotives were concerned, until the 1877 revival of the Lancashire and Yorkshire, the South Eastern certainly carried off the honours.

The South Eastern dog had, however, another trouble which has not been mentioned, in that he had to share a portion of his kennel near London with another animal (which he looked upon as a pariah), viz. : the "Brighton" Railway. The line from London Bridge through Croydon to Red Hill, which formed the old South Eastern main line to Dover, is joint, and crowded with "Brighton" main line trains. Consequently the two dogs were always snapping and snarling at each other, and spent a great deal of time in the process which might have been devoted to more useful purpose. The mutual arrangements over this important section were conducive to trouble. From London Bridge to Corbett's Lane three lines were under the charge of and signalled by the South Eastern ; thence to Croydon the "Brighton" took charge. The ordinary double line between Croydon and Coulsdon Junction was also under "Brighton" management, and then the balance to Red Hill was in the hands of the South Eastern. Consequently whenever the South Eastern trains were late over this section, and they certainly showed no very great regard for punctuality, it was always—according to the South Eastern people—the fault of the other

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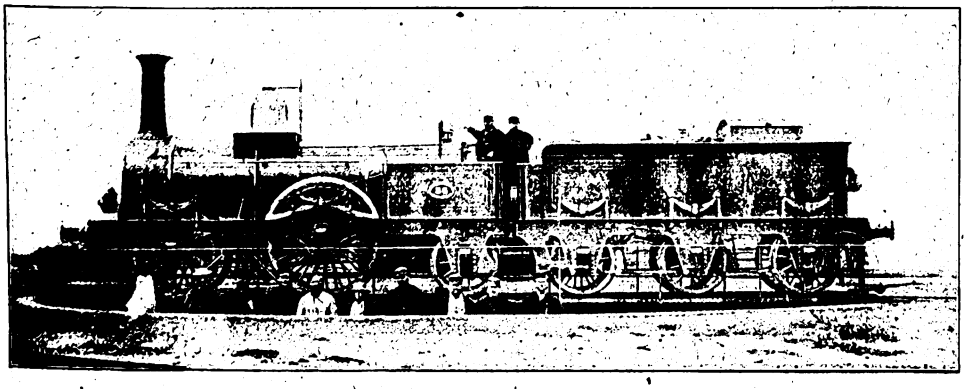
company. Both railways must have maintained a clerical staff for the special purpose of writing letters of complaint to each other, which of course were worded very politely—but what they said of each other in private wasn't.

But it was not only the want of punctuality that gave cause for growling on the part of the travelling public. I think myself that had the general average of the carriages been more comfortable there might have been somewhat less of it. In the quotation from Foxwell given above, mention is made of some good third-class vehicles on the Ramsgate and Hastings trains, and Acworth has a good deal to say about the excellence of certain bogie coaches (first and second-class only) which were run on the Dover mail trains.* Foxwell wrote in 1888 when there were certainly a limited number of good carriages in use on the main line, and Acworth's comments refer to a later date. Moreover, the Hastings and the Ramsgate trains were competitive with those of the "Brighton" and the "Chatham" companies respectively.

But both writers maintained a discreet silence over the average third-class carriages to be met with in large numbers on the branch lines and general services, and also on some of the main line trains of the slower variety, though Acworth does mention casually that (in the early "'nineties" I believe) evidence was given in a law court that the South Eastern still occasionally used some old coaches in local trains, that were put on the road in 1852.

In the 'seventies and early 'eighties the South Eastern carriage stock was unique. Each carriage consisted of two portions—the outside and the inside—of which it is hard to say which beat the other. Dealing firstly with the outside, the painting was something on the lines of the present South Western stock. The colour of the upper portion was an unhealthy looking flesh tint, with a brownish hue below by way of giving the impression that mortification had set in badly on the lower panels. The predominant feature of a long South Eastern train was that hardly any two carriages were alike as to size, height, and contour. There may have been some, of which the dimensions were approximately the same, but they were rarely to be seen together on the same train, and when they were, some mistake in marshalling had probably been made at the carriage sheds. The best view of these travelling panoramas was to be obtained from the end of the one of "Brighton" platforms at London Bridge, from which the unending procession of South Eastern trains on the latter railway could be carefully marked and (metaphorically) inwardly digested by those interested in such matters. The trains were always of considerable length, probably longer on the average than any running out of the Southern London termini, and, formed of coaches of so many varying heights, they seemed to give the impression of moving castellated walls. The vans, which were sprinkled up and down the train, as if they had been emptied into it from a pepper castor, put a finishing touch to the beauties of the "coachscape," for they had the same style of raised box roofs with attic windows above the guard's seats, that may still be seen in considerable numbers on the South Eastern In this respect, however, the vans were at

* These bogie coaches first made their appearance in 1880–1, and were 40½ and 43 ft. long. For an account of the evolution of the South Eastern Railway carriage stock see the RAILWAY MAGAZINE, June, 1899, page 495.



NO. 36, 6 FT. SINGLE EXPRESS ENGINE.
Cylinders, 15 in. by 22 in. Built at Ashford Works, 1855.

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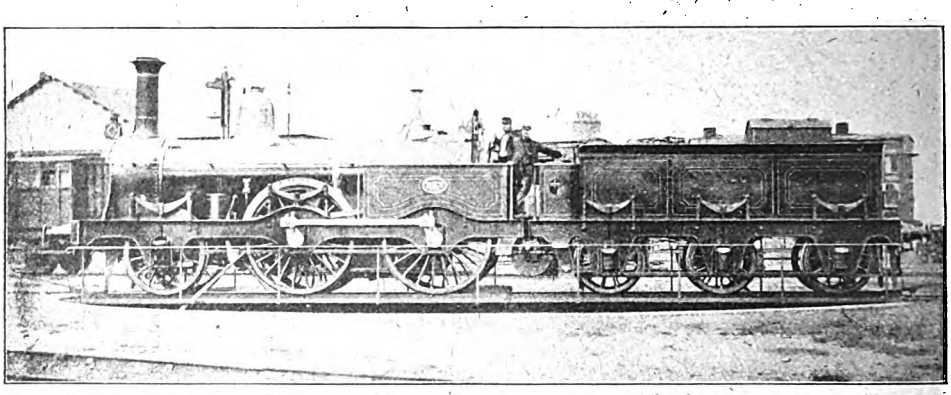

Photo] [*Locomotive Publishing Co., Ltd.*

NO. 232, *Joan of Arc*, STANDARD PASSENGER ENGINE.
118 Class (1857–1875). Wheels, 6 ft. Cylinders, 16 in. by 24 in. No. 232 by Dübs & Co., 1866.

that time similar to those of the old North Eastern, Great Northern, and Lancashire and Yorkshire Railways of the late 'seventies, from which lines they have long ago disappeared.

Most of the carriages were undersized and four-wheeled, nevertheless the wheel bases appeared to be many and various; but there were a number of six-wheelers to be seen, probably constructed when all the possible dimensions of four-wheeled coaches had been exhausted. The styles of windows included Gothic, Norman, and Early English in great variety, intermingled with Elizabethan and Tudor samples. The prevailing window was, however, shaped on the old stage coach pattern, the middle window of each compartment being rectangular and the side ones shaped at the bottom with rounded curves on the partition sides.

So much for the outside, there remains the inside. The first thing a third-class passenger coming from the northern railways usually (and a second-class passenger frequently) did, immediately on entering a South Eastern carriage, was to emerge with great alacrity and have another look at the outside. Then having resigned himself to the inevitable, and made a few "cursory" remarks, he re-entered and did the best he could with the internal scenery. This took the form of a cheerless bare rectangular box with hard wooden seats and "half way" partitions separating the compartments. The partitions were so low that when the passenger sat down with his back to one of them, his head nearly collided with the back hair and best hat of the female in the next compartment. The carriage floor was constructed on the atmospheric principle, and when the train was moving a violent gale frequently raged in those latitudes which lay below the seats. There were usually two oil lamps of about half candle power to each carriage, and as there were four compartments, the allowance of light was ·5 lamp per compartment. The centre of each lamp was immediately above one of the backboards or partitions. But as the South Eastern was always well to the fore in regard to mechanical appliances for rolling stock, an occasional oil lamp was apparently constructed on the sight-feed lubricator principle and delivered about one drop of oil per minute on to the passengers. The drawback to the arrangement was that the only means of regulating the feed of oil was to knock the lamp out into its roof casing by means of an umbrella.

There was however a silver lining even to South Eastern clouds. There was one feature in carriage construction in which this line took the lead, namely, the use of the solid Mansell wheels with wood centres, which were invented on this railway and are now universal on British lines. But only some of the carriages had the added glory of Mansell wheels, and the average passenger as a rule knew nothing of and cared less about their special merits, since they did not help to make the partitions and seats less hard.

The interior of a first-class carriage was of course quite comfortable, for the first-class passenger on the southern lines was in those days considered to be a person of exceptional quality. Moreover, the first-class fare for any distance above 20 miles was considerably more than most of the carriages were individually worth. The fare from London to Dover, for instance, was estimated by competent statistical authorities who used this railway to be approximately equal to the value of four complete South Eastern coaches

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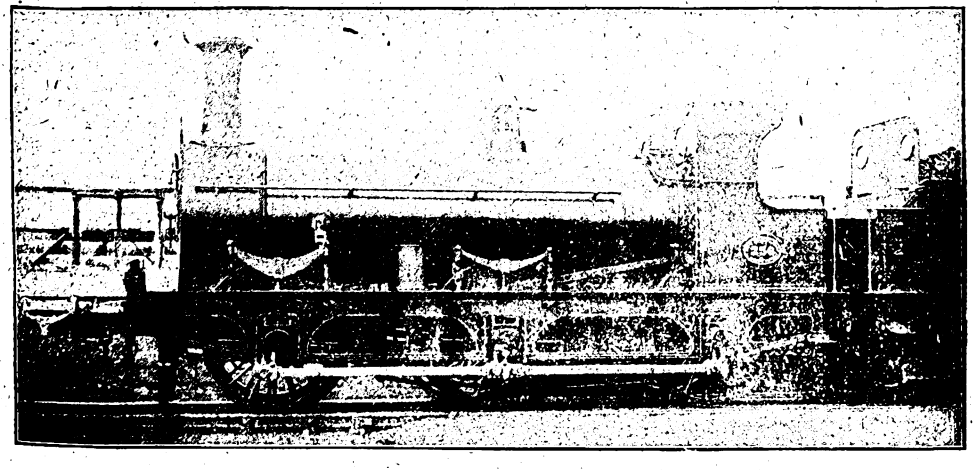
of average quality. On the other hand, it must be stated that the South Eastern to its credit was one of the very earliest railways to introduce lavatories into second-class main line carriages, and this improvement took place at about the same time that the Midland fitted them up in their main line third-class stock. Moreover, in 1880–1 a certain number of first and second-class bogie carriages were constructed.

Of course, everything belonging to the company came in for its share of vituperative comment, and the locomotives did not escape. This, however, was very unfair. Until about 1872 the engines were quite up to the standard prevailing on most railways, and perhaps better than those on some of them. Moreover, there was a great deal more standardisation of the principal types than was the case on any other line except the London and North Western. Of the 258 locomotives which formed the South Eastern stock in 1876 when Mr. J. Cudworth, who was chief locomotive engineer for many years, resigned, there were no less than 124 6 ft. coupled 2–4–0 passenger engines which were almost identical. There were also 16 7 ft. single express "Mail" engines, and 53 goods engines, all standard. The remainder of the stock consisted of engines of older design and also of tank engines, in sets of half-a-dozen to a dozen or so of the same class. There were only seven single framed engines in the whole of the locomotive stock, amongst which were four old goods engines of 1845.

Now, although standardisation has very many advantages, when carried too far it produces certain defects, one of which is that there is a tendency to reluctance in giving up and altering the standards when heavier and more powerful engines become necessary. And it was probably this that temporarily let down the South Eastern locomotive department in the few years preceding the 1876 change. The trains were heavy, and certainly the engines were not powerful enough. Mr. Cudworth's 16 in. cylinders were suitable for the period before 1870, but by 1876 most companies had even passed the 17 in. period, and were entering upon the era of 18 in. cylinders. I shall return to this question later.

Of the older engines there were a few like No. 19, illustrated on page 379, which had 5 ft. 6 in. wheels, and 15 in. by 20 in. cylinders, and also two sets of 6 ft. single engines, which had done duty on the Continental mails prior to 1861 when the larger 7 ft. engines began to appear.

Of the 6 ft. singles Nos. 144 to 151 were domeless locomotives of very neat design with 15 in. by 22 in. cylinders, and owed their origin to Messrs. Sharp Bros. & Co. in 1851. These engines were broken up between 1875 and 1879, most of them disappearing in 1878. The other 6 ft. singles of similar dimensions but of different design were built at Ashford in 1855 for the Dover Mails, and were half-a-dozen in number, Nos. 36, 84, and 175 to 178. These were a small edition of their more famous 7 ft. successors, and had domes with square sandboxes. They lasted until 1880–1882, when Mr. James Stirling broke them up. They were hardy little machines, and early in 1882 one of them was regularly to be



NO. 256. ONE OF THE LAST (1876) SERIES OF CUDWORTH'S GOODS ENGINES.
Rebuilt by J. Stirling.

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seen on the fast morning express from Hastings to London, returning thence at 4.5 p.m. These two trains were, I believe, the only ones on which the Hastings engines ran through to London, and were worked by the same engine every day. In 1879, when some larger coaches made their appearance on it, No. 23, a standard Cudworth 6 ft. coupled, took charge of the trains, but, nevertheless, as mentioned above, one of the old 6 ft. singles returned and ran them until almost the day of its death. Another of the class, No. 178, quartered at Bricklayers' Arms, used to work regularly to Aldershot.

(To be continued.)

Ambulance Train for British Troops in India.

ON the Indian North Western Railway there is in service a particularly fine ambulance train for the conveyance of sick and wounded British soldiers returning to India from the war.

Converted at the railway carriage works at Moghalpura from existing railway stock withdrawn from traffic, the train consists of eight bogie vehicles of the latest design with standard elliptical roofs. Corridor throughout, all the carriages are electrically lighted and fanned.

The total length of the train is 557 ft. 4 in., the total weight when empty being 322 tons 5 cwt. It is painted with the standard North Western Railway colour, having cream-coloured upper panels and purple-brown bottom panels.

The dispensary, illustrated on this page, is well fitted with shelves, and cupboards are provided in the space over the corridor. The dispensing compartment is provided with end double doors and double doors have been provided on each side of the carriage to admit of the standard military stretcher. The compartment contains a folding operating table of special design. Gas is employed for heating the hot water boiler and sterilising apparatus.

THE DISPENSARY, N.W. RAILWAY (INDIA) AMBULANCE TRAIN.

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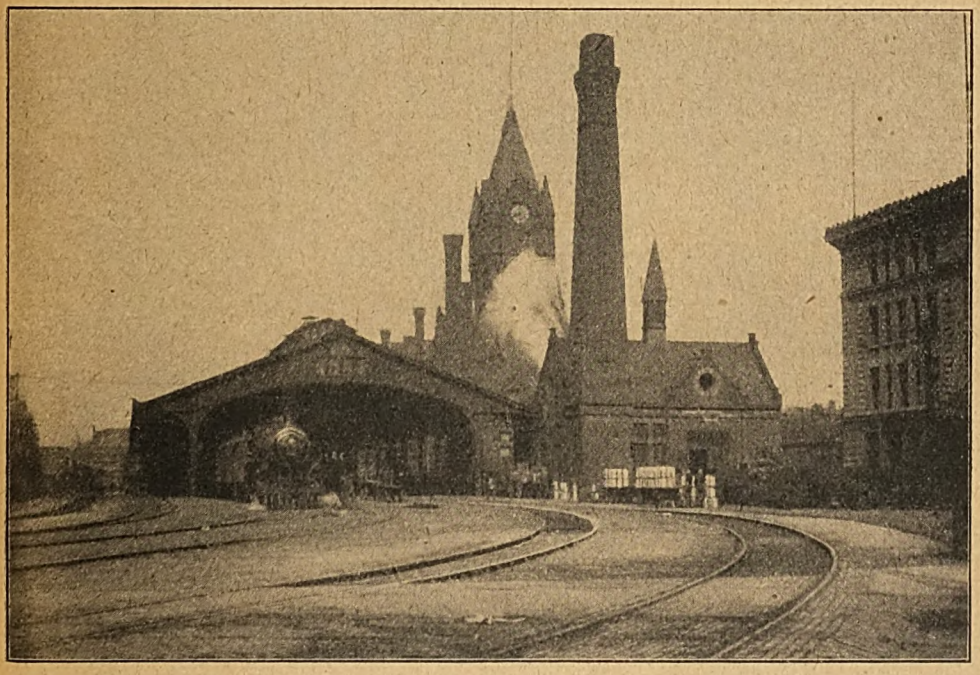
A Run on the "Milwaukee."

By NORMAN THOMPSON.

THERE are seven various ways of covering the 400 odd miles that lie between Chicago and the "Twin Cities of the North-West," and the selection, by the writer, of the Chicago, Milwaukee and St. Paul Railway may have been partially due to the impression created in early days by a large framed map of that system which used to adorn the wall of an "Old Country" tailor



MILWAUKEE PASSENGER DEPÔT.

Chicago, Milwaukee and St. Paul Railway.
City Tramways, Power House and Car Shed on right.

shop. However, that may be, there are a number of more practical advantages associated with this route, which also affords an excellent series of views of the great Mississippi, extending along the "River Division" for nearly 150 miles, in which distance the tracks are never far from the water's edge.

The journey is commenced at the Union Depôt in Chicago, now in process of rebuilding, whence it will emerge a worthy addition to the City's architectural assets, but at the period under notice still a place of gloom and congestion, lingering on until fruition of the long-cherished scheme of enlargement and rejuvenation. This station is also used by the "Pennsylvania," "Chicago and Alton" and "Chicago, Burlington and Quincy" Railways; the latter being a competitor to St. Paul and Minneapolis, striking the Mississippi further to the South and later paralleling the "Milwaukee Line," on the opposite shore.

Whilst awaiting the pleasure of the "powers that be" to grant the assemblage of intending passengers access to the train, one is glad to note through the iron bars that shut off the platform, the somewhat startling yellow livery of the St. Paul cars. The management features this distinctive, characteristic colour scheme; painting the

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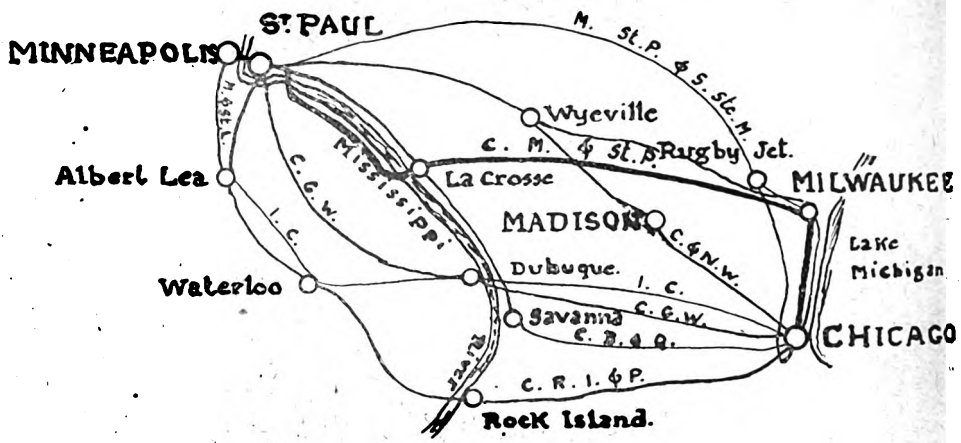
stations the same unusual tint, and garbing the time-table folders in conformity therewith: the intention being to drive home the idea that "Yellow," "Milwaukee" and "Excellence of Service" are synonymous terms.

Sharp on time, the cry of "all aboard" is heard, and "No. 5" starts on the first stage of its run; the 85 miles to Milwaukee, for which the even two hours is allowed, with three intermediate stops. The Northern exit from the Chicago terminal is over a single-track bottle-neck, but otherwise there is the advantage of a second track throughout the journey.

Pausing for a moment at Western Avenue, the City is gradually left behind, and a non-stop run of nearly 60 miles brings the train



Plan of Thro' Car Routes: Chicago-Twin Cities.

to the pretty station of Corliss, junction for Racine on Lake Michigan. *En route* we have passed "Mayfair" and "Golf," this last surely a notable example of terse and forceful station nomenclature. Meanwhile a continual procession has been passing along the car aisles; the conductor examining tickets, the brakeman calling the name of the next stopping-place, and adjusting the ventilation, and last but by no means least, the "newsagent."

This latter personage is often quite a character; he is usually able to estimate to a cent how much each passenger is likely to be good for, after a single searching glance at the varied occupants of the cars. His first appearance is made with papers and magazines, for which he exacts an extortionate price, afterwards recovering any that are abandoned by their purchasers and re-selling them until they become too obviously dilapidated. This he follows up by offering chocolate and candies, and then tries his luck with fruit, anon returning yet again bearing a full supply of smokers' requisites. When the train happens to be light, and business is none too brisk, he will occupy a seat beside a prospective victim, and opening conversation with innocent remarks concerning the weather and similar interesting topics, only takes his departure when thoroughly satisfied that he has caused his prey to disgorge all he appears to possess in way of small change. Intensely ruffled was one of these gentry by the remark, made partly in joke, "you mean to get my last cent." Wrapping himself in an atmosphere of offended dignity, he announced that "he knew what it was to be *down and out* way down in Louisiana," and withdrew leaving the passenger to try and figure out whether he had after all come out on top.

We are now, however, entering the important railway centre and shipping port of Milwaukee, and here there is quite an invasion of passengers, including the inevitable baby, from whose vocal efforts there is no escape in these long non-compartment cars. Milwaukee is a fine city with elegant buildings and a magnificent avenue of residences, of which those on the East side face the broad expanse of Lake Michigan.

The "North-Western" depôt is on the

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shore, and several of that Line's "Twin City" trains pass through from Chicago, instead of running *viâ* Madison. The St. Paul, Minneapolis and Sault Ste. Marie Railroad, popularly known as the "Soo Line," also operates trains from Milwaukee to Rugby Junction on the main Chicago line, which crosses our track a short distance West of the City, and is another competitor for the traffic to St. Paul and Minneapolis.

After leaving Milwaukee we pass "Oconomowoc," a picturesque residential district, and the course turns to the North-West at Watertown Junction, where leaving the Madison line to the left we make for Portage, a junction point 93 miles beyond Milwaukee. Whilst standing here, our train which is of considerable length, blocks a number of level crossings, and one's attention is rather forcibly called to a safety-device which is standard in these parts, by the clamour of the various electric gongs that persist in giving a fussy warning as long as any part of the train is within their respective limits. At night the word "DANGER" also appears illuminated in conjunction with the ringing of the gong.

Getting under way once more, the train moves on past Kilbourn with its delightful dells, New Lisbon and Camp Douglas, where the North-Western Line *viâ* Madison to the "Twins" intersects, and so up the grade to a short tunnel, of which a great deal is thought hereabouts. All windows are rigorously closed, the electric lights switched on, and everything done to impress the traveller with a due sense of the solemnity of the passage of its few hundred yards. This tunnel was recently re-lined without disturbance of the traffic, which is considered to be heavy according to American standards.

Having safely negotiated this alarming (!) portion of its journey, the train hurries down past Bangor, at which point another portion of the North-Western System appears and keeps company on the left to La Crosse, a Divisional Point, where the great Mississippi is struck, 283 miles from Chicago. This station is a terminal so far as the Chicago-St. Paul line is concerned, and a back-shunt is therefore necessary in order to regain the main line. The direct curve from La Crosse to the bridge cannot be used owing to the necessity of always keeping the baggage-cars next to the engine. La Crosse is the third city of Wisconsin, and an energetic business centre with many beautiful homes.

After crossing the river, a brief halt is made at a diminutive station named "Bridge Switch," where an Eastbound train off the Southern Minnesota Division is waiting, and then with the broad expanse of water rippling by on the right, and a long procession of curiously shaped bluffs to the left, dinner is served as the brightly-lighted car speeds through the approaching dusk. Before darkness finally envelops the scene, a glimpse of the Great Western and North-Western lines is obtained at Winona.

Whilst pursuing our way it may be of interest to recall a few points concerning the great system over a small portion of which we are being carried.

The present title dates from 1874. Eleven years previously, the Milwaukee and St. Paul Railroad was incorporated, and 125 subsidiary lines have since been annexed, mainly during the year 1880. This process of consolidation culminated in the acquisition in 1913 of the Puget Sound Lines, which converts the parent system into a transcontinental railway, reaching the Pacific Coast at Seattle and Tacoma, and by a recent extension, entering the "Inland Empire" city of Spokane.

COMPARISON OF SERVICES: CHICAGO TO ST. PAUL.

LINE.	Miles.	Fastest Time.	No. of Trips.
		H. M.	
Chicago, Milwaukee and St. Paul	413½	11.30	4
North-Western Line, via Madison	398	11.30	3
" " " " Milwaukee	410½	12.30	2
Chicago, Burlington and Quincy	431	12.00	3
Chicago Great Western	424	13.00	2
Minneapolis, St. Paul and Sault Ste. Marie	449	13.40	2
Chicago, Rock Island and Pacific	514	15.40	1
Illinois Central, connecting with Minneapolis and St. Louis	490	15.50†	1

† Minneapolis.

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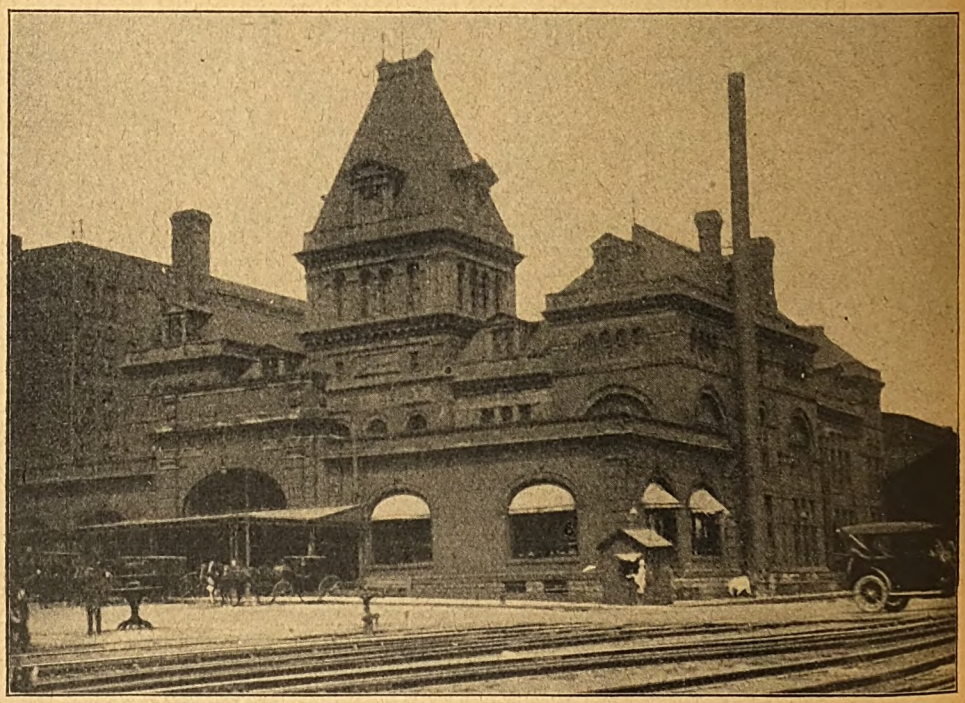
In addition to the territory suggested by its title, the Chicago, Milwaukee and St. Paul Railway serves a wide area, including many centres of population in Missouri, Iowa and the Dakotas, of which Kanas City and Omaha may be specially mentioned; the total mileage being rather in excess of 10,500 miles. Between Manilla and Omaha there occurs a curious group of wayside stations, all included within a distance of 16 miles, named respectively: "Panama," "Portsmouth," "Persia" and "Yorkshire," but the passenger who has penetrated to this geographical medley from nine railways. After a long wait, the last section of the journey is entered upon, the distance of 10 miles to the adjoining city of Minneapolis.

Having parted with a large proportion of its passengers, the train climbs steadily higher and higher, past the suburban station of Merriam Park. The river is once again crossed just below. St. Athony's Falls, and the Washington Avenue terminal, in Minneapolis, reached at about 10 p.m.

The "Twins" are both splendid places in which to make a stay, being known as the "Cities of Lakes, Gardens and Rivers,"



UNION DEPÔT, ST. PAUL.
This station is used by nine railways.

Chicago will have already come through Hampshire, Genoa, Lanark, Oxford Junction, Melbourne, Cambridge, Madrid and Jamaica, and so will probably be incapable of any further feeling of surprise.

It is time to realise now, that having passed Minnesota City and Wabasha, and approached close to the river bank and on through Lake City and Red Wing, we are actually at Hastings. Here we re-cross the river and continue along its left bank *viâ* Newport to St. Paul, where the Union Depôt (for which a palatial successor has been designed) is utilised by no less than

and their pronounced commercial activity has not been allowed to flourish to the detriment of the lavishly-bestowed natural advantages of the neighbourhood. Beautiful Lake Minnetonka, the celebrated Falls of Minnehaha, Old Fort Snelling and numberless lakes and parks provide an almost unlimited field for exploration.

Hundreds of miles of electric lines enable the visitor to take short trips in every direction; whilst the Mississippi River Steamboats, though the height of their glory is gone for ever, are still available for passengers who desire a water trip

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full of interest on one of these quaint craft.

The through service between Chicago and St. Paul–Minneapolis consists of four trains Westbound, and one more in the reverse direction; of these, the "Olympian" and "Columbian," running to and from the Pacific Coast, and hauled over the Mountain Divisions by electric locomotives, are well known amongst transcontinental travellers.

The stretch of line from which the steam locomotive is rapidly being banished measures 440 miles situated in the States of Montana and Idaho, and the first portion saw the transition consummated in 1916.

Mainly the decision to change the source of power was influenced by the necessity of expediting the movement of heavy trains over a section of the line that could not conveniently be double-tracked owing to the rough nature of the country traversed, as many as three mountain ranges being encountered, but the existence of an abundant supply of water power within easy access no doubt was a contributing factor.

From Chicago to St. Paul, a distance of 413½ miles, the quickest time is made by the "Columbian," which consumes 11 hours 30 min. on the journey, with twenty regular stops and two contingent ones.

The United States Government entrusts to Mail to this route, and the "Fast Mail" Eastbound occupies 10 min. longer, with seventeen stops.

The "originality" of the Milwaukee System is emphasised in the title of "Pioneer Limited," being attached to the night trains that accommodate traffic between Minnesota and Illinois.

It is claimed by the management that this is the first line to and from Chicago and the "Twin Cities"; both in regard to date and service; that it is the only railway owning the whole of the cars running on its trains and dispensing with the employees of the Pullman Company: and that it was the earliest to instal electric light and steam heat in its passenger equipment.

Further, it is the only line under one individual control between Chicago and the Pacific North-West, although the association of the "Burlington Route" with the Great Northern and Northern Pacific Railways might possibly be regarded as another such instance.

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SCENES ON THE SOUTH INDIAN RAILWAY.

From photographs by Mr. F. Tosland.

1. Ceylon Boat Mail train at Madura Junction station.
2. Ceylon Boat Mail train at Dindigul station.
3 & 4. s.s. *Hardinge* at Dhanushkodi Pier. Three steamers of this type maintain the service between India and Ceylon *viâ* Dhanushkod' (South Indian Railway) and Talaimannar (Ceylon Government Railway). The boat mail train is seen alongside the steamer.

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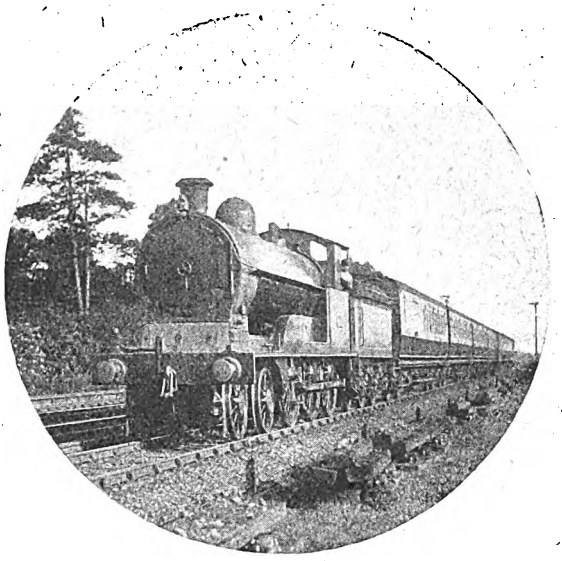
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*H. T. Worlock.*

LONDON AND NORTH WESTERN RAILWAY.

Down Northampton train near King's Langley.
Experiment class, 4–6–0 locomotive, No. 1709,
Princess May.

SOME of our so-called "giants" of the road would look rather lilliputian were they placed alongside the latest mammoth that has issued from the Baldwin Locomotive Works in the United States for the use of the Virginian Railroad. The dimensions of this machine are truly colossal. We are prone over here to consider the provision of four cylinders 16 in. diameter by 26 in. stroke as requiring a good steam raising capacity to "match," but what should we say to *six* cylinders, each *thirty-four* inches by *thirty-two* inches in size? A 5 ft. 6 in. boiler creates a good impression of size to our eyes, but this colossus is content with no less diameter than 8 ft. 4 in., a water-heating surface of 8,120 sq. ft., and a super-heating surface of 2,059 sq. ft.—total, 10,179 sq. ft.! The fire-grate has the modest area of 108 sq. ft. While as to weight—on the whole of the 30 wheels by which the engine is borne there rests a total of 377 tons, 324 tons of which are available for adhesion. With coupled wheels 4 ft. 8 in. diameter, and a working pressure of 215 lbs. per sq. in., the tractive force exerted by No. 700 of the Virginian Railroad reaches the formidable total of 166,300 lbs., or actually over 74 tons!

The principle on which this extraordinary locomotive is operated is what is known as "Triplex" articulation, *i.e.*, a further extension of the Mallet system, with three groups of driving wheels instead of two. That is to say, the wheel arrangement is 2–8–8–8–4, the last group of coupled wheels and the rear bogie being located under the tender. All three groups of coupled wheels have cylinders of equal size, the central cylinders taking superheated steam at high pressure, and exhausting into the pairs of cylinders in front and behind. The ratio of compound expansion is, therefore, as one to two. Exhaust steam from the leading cylinders is passed into the smokebox and creates the draught, while that from the rear cylinders is passed through a feed-water heater and thence out into the atmosphere by means of a vertical exhaust pipe at the back of the tender. Arrangements are made for all cylinders to take live steam on starting, the exhaust from the high-pressure cylinder then passing into the smokebox, and through an annular blast orifice surrounding the main orifice, but after getting "under way" the "Simplex" intercepting valve changes its position automatically, diverting the high-pressure exhaust to the low-pressure receiver and causing the engine to work compound.

Gargantuan indeed is the appetite of this leviathan. In the course of a two-hours' test the consumption of coal was 15,000 lbs. (nearly 7 English tons), and of water 12,000 gallons. As regards the former, the burden of shifting 3½ tons per hour does not, fortunately, rest upon human agency, but upon a Street

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FASTEST RUNS ON BRITISH RAILWAYS: JANUARY, 1917, TIME-TABLES.

Railway.	Train.	From.	To.	Distance Miles.	Time Min.	Average Speed m.p.h.
N. E. R.	9.34 p.m.	York	Darlington	44·1	45	58·8
L. & S. W. R. ..	5. 9 p.m.	Basingstoke	Vauxhall	46·5	49	56·9
G. C. R.	†4.13 a.m.	Rugby	Leicester	19·9	21	56·9
G. W. R.	11. 0 a.m.	Paddington	Bath	106·8	115	56·6
G. N. R.	5.46 p.m.	Hitchin	Huntingdon	27·0	¶29	55·9
L. & N. W. R. ..	*8.42 a.m.	Willesden	Rugby	77·2	84	55·1
G. E. R.	12.50 p.m.	Shenfield	Rochford	18·5	¶21	52·9
Midland R.	12.15 p.m.	Appleby	Carlisle	30·8	35	52·8
S. E. & C. R.	8.34 a.m.	Sandling Junc.	Tonbridge	35·8	41	52·3
Cheshire Lines ..	Various	Manchester	Warrington	15·7	18	52·3
Caledonian R... ..	4. 1 p.m.	Forfar	Perth	32·5	38	51·3
G. N. R. (I.)	6.25 p.m.	Dublin	Dundalk	54·3	64	50·9
N. B. R.	5.40 p.m.	Polmont	Haymarket	21·2	¶26	48·9
G. S. & W. R. (I.) ..	10.12 a.m.	Limerick Junc.	Mallow	37·5	46	48·9
L. & Y. R.	Various	Liverpool	Manchester	36·5	45	48·7
L. B. & S. C. R. ..	10.28 a.m.	Croydon	Hayward's Heath	27·5	34	48·5
G. & S. W. R. ..	‡6. 5 a.m.	Dumfries	Kilmarnock	58·1	75	46·5

† Also 10.41 a.m. * Also 0.9 a.m. Rugby–Willesden. ‡ Also 5.18 p.m. ¶ Working times.

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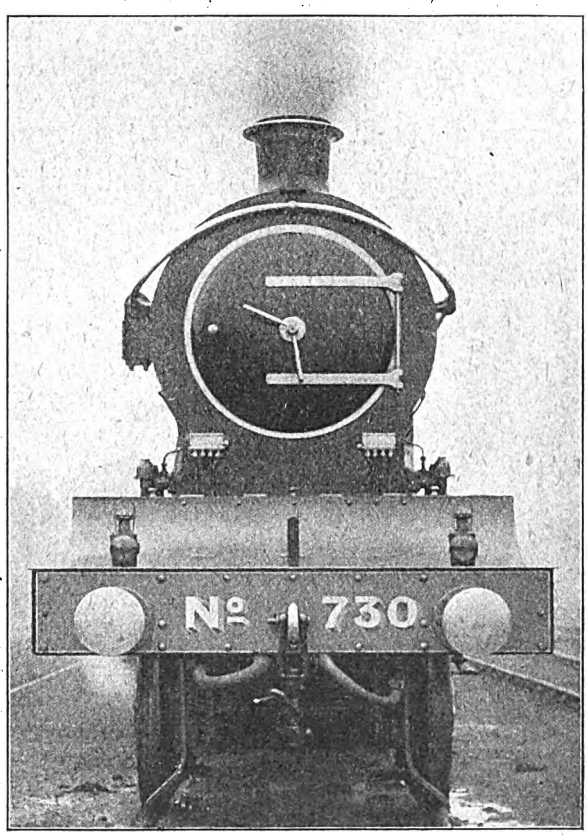
mechanical stoker. The work for which the engine has been designed, however, is very arduous. No. 700 has to bank coal trains, weighing gross 2,500 tons, up a continuous gradient of 14 miles, mostly at 1 in 49, and with numerous reverse curves closely succeeding one another, from Elmore to Clark's Gap, Va. The train engines are of the Mallet type, having the 2–6–6–2 wheel arrangement. Presumably the brobdingnagian proportions of such engines as these new ones are commercially a sound proposition, or they would not be built. But the excessive wear and tear of track arising from the concentration of 324 tons load on a coupled wheelbase of 67 ft. 7 in., with a weight of 27 tons on each of the 12 coupled axles, and the tremendous time taken in the operation of such gigantic loads over a single line, leave a good deal to be said for the British method of smaller engines, lighter trains and many tracks, with our greater resultant rapidity of operation.

Coming now back to this side of the water again, I want to make a few more remarks about the time-tables. Melancholy indeed as is the study of them, one can still, fortunately, make out a fairly decent list of the fastest trains running on each British line, and as this feature is for the first time omitted from the current "Railway Year Book," owing to war conditions, I have compiled a list which is reproduced herewith, and is supplementary to the notes on the new train services given in my article of March last. I do not guarantee its accuracy, and students of "Bradshaw" who are more lynx-eyed in their mastery of the intricacies of that volume than myself may be able to instance faster runs than those I have given. Certain also of the times shown in the table are "working" times, and differ slightly from those found in the published time-books. At the same time I am describing some recent experiences of my own and of correspondents on the new time-tables, as showing that there is still running to be found that is up to the very best traditions of British express locomotive work.

Although the "Fastest Train in the British Empire" is temporarily non-existent, the North Eastern Railway still takes the same place at the top of the table—and, I suppose, still retains its "Empire" claim—in the schedule of the 5.30 p.m. from King's Cross, as from York northward. This allowance of 45 min. for the 44·1 miles' journey also appears to include a conditional stop to set down at Northallerton, but when that is made I take leave to doubt that the running time for the journey is compassed in three-quarters of an hour! When I was last on the train, quite recently, anxious enquirers came from compartment to compartment at York seeking passengers for Northallerton, but—fortunately—finding none, and thereby failing to disappoint me of the sterling run made by No. 727, a three-cylinder superheater "Atlantic" of class Z. The load was by no means to be despised, consisting as it did of eight bogie corridor coaches, one non-corridor North Eastern Railway eight-wheeler, and a six-wheeled



Photo] [*R. J. Purves.*

NORTH EASTERN RAILWAY.

Four-cylinder compound "Atlantic" type express locomotive, No. 730.

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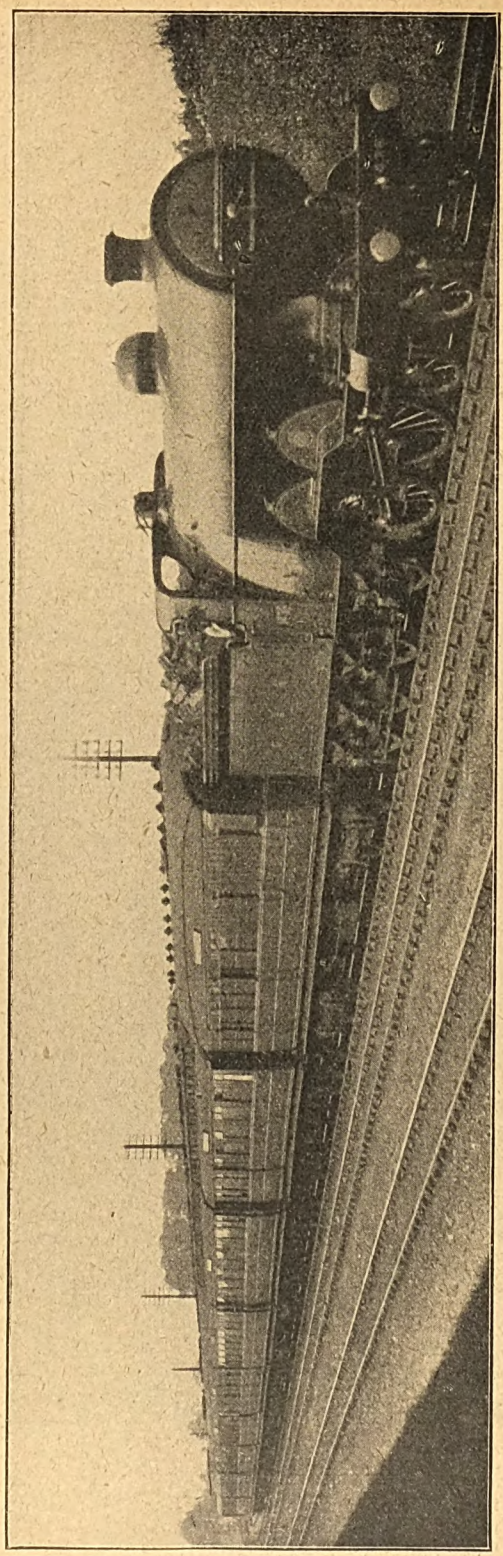

[F. E. Mackay.

GREAT NORTHERN RAILWAY.
Up Leeds and Bradford express near Potters Bar.

Photo]

van, 39 axles, which weighed empty 269 tons, and with a heavy complement of passengers and luggage fully 290 tons behind the tender. A strong easterly side-wind hampered the running.

The sharp curves out of York are somewhat of a hindrance to a rapid start, and so we took 8 min. 35 sec. to get through Beningbrough, 5·5 miles, but we had then just reached the mile-a-minute rate. From that point we accelerated to 64 m.p.h. at Alne and 66 at Raskelf, falling on the faintly rising grades beyond to 65 at Pilmoor and 64 m.p.h. again at Sessay. But on the level stretch between Sessay and Thirsk speed rose to a sustained 69 m.p.h., and even the 7 miles up at 1 in 626 to Northallerton failed to reduce the rate below 64 m.p.h. On the easy grades to Danby Wiske we touched 68 m.p.h., and the 4 miles at 1 in 696 up to Eryholme were for the third time productive of a minimum speed of 64 m.p.h. Finally, on the 2¼ miles' descent at 1 in 356-377 to Croft Spa we sprinted to 72½ m.p.h., before shutting off steam at Croft Junction. Thus for fully 34 miles the speed had ranged from 64 to 72½ m.p.h. continuously, the 37·9 miles from Beningbrough to Croft Junction, with the road very slightly, but distinctly against the engine almost all the way, occupying only 34 min. 40 sec., at an average speed of 65·6 m.p.h. From the start Alne, 11·2 miles, was passed in 14 min. 10 sec.; Pilmoor, 16·1 miles, in 18 min. 40 sec.; Thirsk, 22·2 miles, in 24¼ min.; Northallerton, 30 miles, in 31 min. 20 sec.; Danby Wiske, 33·7 miles, in 34¾ min.; Eryholme, 38·9 miles, in 39½ min.; Croft Spa, 41·5 miles, in 41¾ min.; and Croft Junction, 43·4 miles, in 43½ min.—just inside "even time." Running smartly into Darlington, we stopped with 5 sec. in hand, having completed the 44·1 miles' journey in 44 min. 55 sec. start-to-stop. "Some" war-time schedule, this!

I came back a day or two later

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by the up day "Scotsman," with a load of vast dimensions, totalling 15 bogie vehicles, 62 axles, 443 tons empty, and, with a very full train, quite 480 tons gross behind the tender, or even more. With the equally tremendous allowance of 56 min. for a 44 miles' journey on a level road, however, the prospect need not have appalled the driver of No. 2198, another "Z" class 4–4–2, but it so happened that we were late away from Darlington, and set out at once to recover the arrears. Eryholme, 5·2 miles, was passed in 9½ min., and Northallerton, 14·1 miles, in 19½ min., after which comparatively leisurely start the running became brisk. We touched 64 m.p.h. at Otterington and 66 at Thirsk, fell to 62½ at Sessay, but rose again to a sustained 66 at Alne, whence the rate fell away gradually to 64 at Skelton Bridge and 60 m.p.h. at Poppleton Junction. The 28·4 miles from Northallerton to Poppleton Junction were covered in 26 min. 50 sec., the times from the start being to Thirsk, 21·9 miles, 27 min.; Pilmoor, 28 miles, 32 min. 50 sec.; Alne, 32·9 miles, 37 min. 20 sec.; Beningbrough, 38·6 miles, 42 min. 35 sec.; and Poppleton Junction, 42·5 miles, 46 min. 20 sec. Running very cautiously into York, and slightly checked by signal, we completed the journey in 49¼ min., or rather less than 49 min. net, which was the old time allowance for this train, and showed a gain of 7 min. on the new time. Such running was, even if not phenomenal in character, certainly very creditable. It would have been more enjoyable to me had I not been located in the very last compartment of an extra "compo," attached at the last minute to the back of the train on a very cold day, and 15 full coach lengths removed from the source of heating!

Second on the list comes the London and South Western Railway, which, like the Great Eastern, has done practically no deceleration, other than that actually necessary by the insertion of stops in lieu of cancelled trains. In due consideration of all circumstances, and especially those of road and load, I am inclined to think that the "crack" London and South Western bookings between Waterloo and Exeter are the most brilliant that war-time conditions have left us. That which figures in the table is one that is favoured by the grading of the road, which is with the load almost throughout, but more remarkable is the retention of such schedules as that of 91 min. from Waterloo to Salisbury, 83·8 miles, averaging 55·9 m.p.h., or 86 min. for the 75·8 miles of mountainous grades from Salisbury on to Sidmouth Junction, average 52·9 m.p.h. I am looking forward to an opportunity of trying one or two of these London and South Western "fliers," but a friend to the results of whose careful and painstaking observations I have been indebted for a number of the runs which have appeared in these pages from time to time but a few weeks ago furnished me with a log of the train just referred to—the 11 a.m. *ex*-Waterloo—on which the locomotive work, magnificent throughout, was in parts superior to anything I have known recorded on the line in question.

From Waterloo the load was one of 11 bogies, including dining car, of a tare weight of 311 tons, and with passengers and luggage weighing 330 tons. The engine was No. 464—one of Mr. Drummond's final 463–472 batch of 4–4–0's, subsequently rebuilt by Mr. R. W. Urie and fitted with superheater equipment. Wind was in the north, and was blowing strongly. The start was not very rapid, as the engine slipped rather badly on the short initial rise out of Waterloo, and so took 7¼ min. to Clapham Junction, 4 miles; 11 min. 13 sec. to Wimbledon, 7·3 miles; and 16 min. 13 sec. to Surbiton, 12·1 miles. At Hampton Court Junction, passed in 17 min. 31 sec. (13·4 miles) the speed was 66 m.p.h., at Walton it had fallen to 56, but the 1½ miles' drop at 1 in 330 past Weybridge raised it to 64 m.p.h. Weybridge, 19·2 miles out, was passed in 23 min. 8 sec., and Woking, 24·4 miles, in 28 min. 13 sec., ¼-min. behind time, the effect of 4 miles up mostly at 1 in 388 having been to reduce the speed to 57 m.p.h. But then came a couple of signal checks, at Brookwood and Pirbright, which resulted in the 8·9 miles from Woking to Farnborough taking 11 min. 8 sec.

Thenceforward No. 464 did splendidly. Attaining 62 m.p.h. on the 6 miles of level past Farnborough, she tackled the 2¼ miles at 1 in 337 and 1 at 1 in 480 (with 1¾ intervening miles of level just beyond Winchfield) with no lower rate than 54 m.p.h., touched 62 on the very brief descent beyond Hook, and went up the 4½ miles at 1 in 249 past Basingstoke to Worting Junction at a minimum of 46 m.p.h. This gave a time from Waterloo of 46 min. 25 sec. to Winchfield, 39·9 miles; 54 min. 57 sec. to Basingstoke, 47·9 miles (where the train was barely a minute behind time); and 58 min. 55 sec. to Battledown Junction, 51·1 miles. On the falling grades to Andover—4¼ miles at 1 in 550 and 1¼ at 194, with intervening strips of level and uphill, and a concluding drop of

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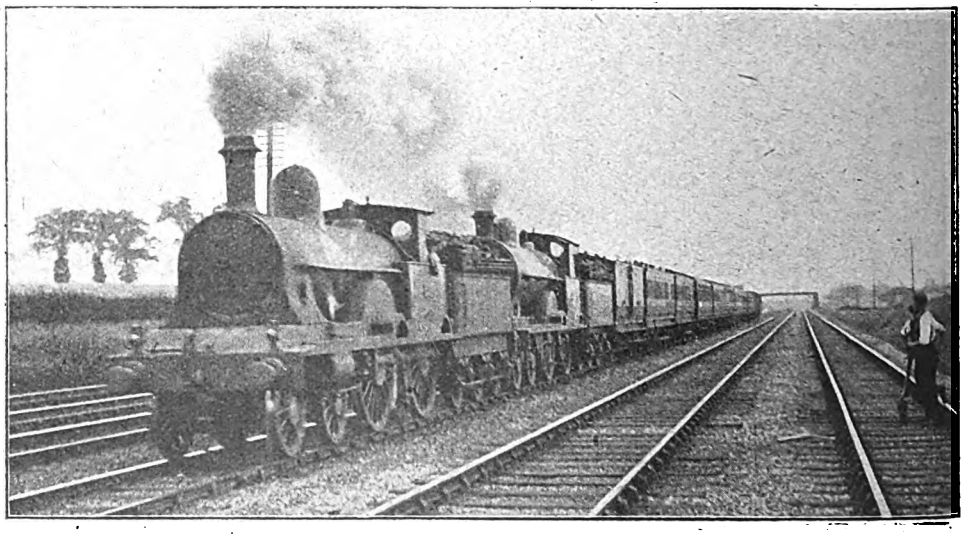
3 miles at 1 in 178—the top speed was 81 m.p.h., Whitchurch, 59·3 miles, being passed in 67 min. 28 sec. and Andover, 66·3 miles, in 73 min. 29 sec. This rush carried the train up the 1⅝ miles at 1 in 220, 1¾ at 1 in 264 and 2¾ at 1 in 165 to Grateley at a minimum rate of 48 m.p.h., Grateley, 72·8 miles from Waterloo, being passed in 79 min. 39 sec., and then followed a "hurricane" descent of the long bank into Salisbury, with a top speed again of 81 m.p.h., and a very rapid finish, whereby the 5·5 miles from Porton to the dead stop were reeled off in the remarkable time of 5 min. 5 sec. This, therefore, gave a total time of 90 min. 27 sec. from Waterloo, ½-min. under schedule, and in 88½ min. net, or 2½ min. under schedule, if due allowance be made for the two delays. The most outstanding features of this excellent run, of course, are the times of 35½ min. from Basingstoke and 16 min. 58 sec. from Andover into Salisbury, distances of 35·9 and 17·5 miles respectively.

At Salisbury two coaches were detached, leaving nine 8-wheelers, of a weight of 239 tons tare and 250 tons gross, to go forward in the charge of No. 445. This is one of Mr. Drummond's 6 ft. 7 in. 4–6–0 engines, also rebuilt by Mr. Urie with superheater, and noteworthy indeed was the work performed, especially uphill, even though the load certainly was not very heavy. From Salisbury out to Semley the grades are almost all adverse, with the exception of five short downhill or level lengths aggregating 6 miles. Six miles of the ascent are at 1 in 200 or steeper, and 4¼ are steeper than 1 in 150, including the final 2⅛ miles at 1 in 145 to Semley Summit. Yet Dinton, 8·3 miles, was passed in 12 min. 9 sec., and Semley, 17·6 miles, in 21 min. 58 sec., at a speed of 50 m.p.h., these being the finest times out of Salisbury that I have ever known. Downhill to Gillingham the top speed was 76 m.p.h., and the same again before Templecombe, the minimum on the short rise beyond Gillingham (a mile at 1 in 300 and another at 100) being 66 m.p.h. So Gillingham, 21·7 miles, was passed in 25 min. 47 sec., and Templecombe, 28·4 miles, in 31 min. 42 sec.



Photo] [*W. H. C. Kelland.*

LONDON AND NORTH WESTERN RAILWAY.
Down express travelling at 60 miles per hour near Kenton.
Webb 4-cylinder 4-4-0 compound ("Jubilee" class) piloting, and 4-4-0 "Precursor" as train engine.

Now comes the rise past Templecombe—½-mile at 1 in 160, ⅞-mile at 1 in 80 and 1⅜ at 1 in 100—and on this the lowest speed was 44 m.p.h., the highest rate on the succeeding descent to Yeovil Junction being 77 m.p.h. Sutton Bingham bank, which consists of ¾-mile at 1 in 200 and 2½ at 1 in 150–140, reduced the rate to 51 m.p.h.—a fine figure this—and the two easy succeeding miles produced an acceleration to 66 m.p.h. Crewkerne bank boasts 2¾ adverse miles at 1 in 80, and was productive of a minimum rate of 34 m.p.h., but the speed was high on the long succeeding descent to Axminster, the maximum being 78 m.p.h. So Sherborne,

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34·5 miles from Salisbury, was passed in 37 min. 47 sec.; Yeovil Junction, 39·1 miles, in 41 min. 49 sec. (the booked time to this point, which is the only passing time shown in the working book between Salisbury and Sidmouth Junction, is 43 min.); Crewkerne, 47·9 miles, in 50 min. 29 sec.; Hewish Box, 50·5 miles, in 54 min. 32 sec.; Chard Junction, 55·9 miles, in 59 min. 33 sec.; Axminster, 61 miles, in 63 min. 48 sec.; and Seaton Junction, nearly 2 miles up the ascent to Honiton Tunnel and 64·3 miles from Salisbury, in the magnificent time of 66 min. 36 sec. Seaton bank is by far the worst of any between Salisbury and Exeter, including as it does in its unbroken length of 7¼ miles 1⅜ at 1 in 100, 4½ continuously at 1 in 80 save for an intervening ½-mile as steep as 1 in 70, and a final ¾-mile at 1 in 132. Up this veritable mountain-side the minimum rate was 27 m.p.h., the final mile between posts 152½ and 153½ taking 63 sec. So mile-post 153½, 69·7 miles from Salisbury, was passed in 76 min. 21 sec. from the start, and with a swift descent past Honiton, touching a maximum of 77 m.p.h., Sidmouth Junction, 75·8 miles, was reached in 82 min. 35 sec., the average start-to-stop speed working out at 55·1 m.p.h.

The short final length from Sidmouth Junction into Exeter was run at tremendous speed, as the 12·2 miles were covered in 13 min. 17 sec., start-to-stop, instead of the 14 min. allowed. And the grades are not entirely favourable, although largely so. In descending past Whimple a top speed of 78 m.p.h. was attained, while the minimum on the 2 miles of Pinhoe bank, mostly at 1 in 100, was 55 m.p.h. Pinhoe, 9·3 miles from Sidmouth Junction, was passed in 9 min. 20 sec.! Now the sum of the two running times —Salisbury to Sidmouth Junction and Sidmouth Junction to Exeter—amounts to 8 sec. under the old non-stop allowance of 96 min. from Salisbury to Exeter, clearly showing that No. 445 could have suffered a signal stop of 8 sec. at Sidmouth, and still have kept time on the booking referred to. If we deduct the "cost" of stopping at Sidmouth Junction, and allow an average of 75 m.p.h. from Honiton to Whimple (which is not excessive as the actual speed was 77 m.p.h. at the former point and 78 at the latter), we get the extraordinary net time of 92½ min. for the 88 miles from Salisbury to Exeter, 3½ min. under the 96 min. schedule, and involving an average of 57·1 m.p.h. over one of the hardest main lines in the kingdom. On average running it may be taken that 1¼ min. were gained from Salisbury to Templecombe, a further ¼-min. thence to Crewkerne, and 1¾ min. in addition from Crewkerne to Axminster, the final ¼-min. of the 3½ min. gain to Sidmouth Junction being achieved on the last length of the journey. Four minutes of arrears on leaving Salisbury were by this truly magnificent effort converted practically to schedule time at Sidmouth Junction, and the driver deserves every commendation.

In the third place of the speed table we find the Great Central Railway, which has still some very fast runs in its time-tables, and most of whose decelerations are only of the most infinitesimal character. Closely approaching the "snippet" tabled is that of the 6.10 p.m. down Bradford express *ex*-Marylebone, now booked to stop at Woodford instead of slipping a coach there, and to run thence to Leicester, 34 miles, in 36 min., average 56·7 m.p.h. Both these two runs, of course, are made with the advantage of falling grades for the major part of their length. The 6.10 p.m. down, by the way, has called, from April 2nd onwards, at Brackley additionally to previous stoppages. In the January time-tables the Great Western Railway claimed third place with its booking of the 4 p.m. from London to Chippenham, 94 miles, in 99 min., averaging 57 an hour. But with the reopening of the Box Tunnel this time has been increased to 101 min., as that of the 6.30 p.m. down also, so that the 11 a.m. West of England express claims the honour of representing the Great Western Railway, but in the fourth place of the table, with its 115 min. run to Bath. And yet I have, among a collection of runs awaiting opportunity for publication, one timed quite recently by a friend on this very train on which Bath was passed in 7 sec. under 102 min.! Some of these Great Western Railway decelerations are truly the most tragic of any.

Next in the list we have the Great Northern Railway, with its old-established 29 min. "sprint" from Hitchin to Huntingdon. But with a road of an almost unbroken falling tendency, such a schedule is simplicity itself as compared with, say, the 125 min. allowed the 5.30 p.m. *ex*-King's Cross to Grantham or the 56 min. thence to Doncaster, representing average speeds of 50·6 and 54·1 m.p.h. only. With a load never less than 13 big bogie vehicles, and not infrequently of 14 or 15—I noticed no less than 16 on a recent evening, with a side-wind and a drizzling rain—the maintenance of this booking requires some very hard work. As I

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mentioned in the March issue, my latest runs on the 5.30 p.m. down, in each case with 14 bogies behind the tender, resulted in actual times of 138½ and 139¾ min. to Grantham, and 60 min. and 58 min. 20 sec. thence to Doncaster respectively, although we had a superheater "Atlantic" on in each instance, very slow work out to Hatfield was responsible on both runs for loss of time, the actual time to this point on the first run being 35 min. 20 sec. and on the second 33 min. 40 sec. Peterborough to Grantham, also, was a length consuming a considerable amount of time, in the first case 40½ and in the second 40¼ min. It is only fair to mention that on the second run we were stopped dead for signals at Hitchin South for 3 min. 50 sec.—a delay which cost us fully 8 min., and that the time from there to Peterborough of 47 min. 40 sec., start to pass, was not a bad one for the distance of all but 45 miles. But I will pass over the Great Northern Railway for the present, as I hope to give that line some attention next month.

The London and North Western time-tables, although "patchy" in character, still retain some good timings, as the two which occupy the sixth place in the table. Most fortunately I am able to include herewith the description of a magnificent run with the 8.30 a.m. down Irish boat train from Euston, timed by the same friend as the run last described. Engine No. 404, *Eclipse*, of the "George the Fifth" class, was at the head of a tremendous train of 60 axles, weighing empty, curiously enough, 404 tons, and full, my correspondent estimates, 425 tons. The wind was in the west, and strong. From Willesden Junction, where the log commences, the start was most brisk, corrected miles in succession being covered in 2 min. 45 sec., 88, 79, 75 and 72 sec. At Pinner, despite the continuously rising grade of 1 in 341–330, the speed had risen to 53 m.p.h., which was the maintained speed also at Tring Summit, the intervening maximum on the slight descent from Bushey to Watford being 63 m.p.h. So Harrow, 6 miles from the start, was passed in 8 min. 55 sec.; Watford, 12·1 miles, in 15 min. 40 sec.; Boxmoor, 19·1 miles, in 22 min. 42 sec.; and Tring, 26·3 miles, in 30 min. 26 sec. These

Photo] [*J. G. Irving.*

CALEDONIAN RAILWAY.
Down West Coast express near Kirkpatrick.
4-4-0 locomotive, No. 60.

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are quite astonishing figures, in consideration of the almost continuously adverse gradient, even though the latter be moderate, the heavy load, and the type of engine employed.

Equally moderate as is the down-grade beyond Tring, *Eclipse* ran freely at 75 m.p.h., covering the 8·5 miles from Tring to Leighton in 7 min. 29 sec., and the 6·5 miles thence to Bletchley in 5 min. 33 sec., making a total of 43 min. 28 sec. for the 41·3 miles from the start. At Wolverton there was a bad permanent way slack, costing fully 2½ min., but despite that the speed recovered up the 1 in 330–335 from Castlethorpe to Roade to the fine figure of 54 m.p.h., the 5·8 miles from Bletchley to Wolverton taking 5 min. 56 sec., and the 7·4 miles thence to Roade 9 min. 35 sec. On the easy grades beyond Blisworth the top speed was 70 m.p.h., renewed, after a minimum of 56 m.p.h., at Kilsby Tunnel, by a further smart sprint at 69 before Rugby. So the 3 miles from Roade to Blisworth took 3 min. 9 sec.; the 6·8 miles from Blisworth to Weedon 6 min. 13 sec.; the 5·6 miles thence to Welton 5 min. 29 sec., and the last 7·3 miles into Rugby 7 min. 59 sec.—total 22 min. 50 sec. from Roade instead of the 25 min. allowed. The run from Willesden had actually been made in 81 min. 49 sec., despite the delay encountered, but the net time for the 77·2 miles certainly did not exceed 79¼ min.—an economy of 4¾ min. on schedule.

Just as excellent running followed beyond Rugby, with the same engine. Miles from the start in this case occupied 2 min. 42 sec., 89 sec., 81 sec., 78 sec. and 69 sec., totalling, oddly enough, exactly the same to a second as for the 5 miles out of Willesden, *i.e.*, 1 sec. under 8 min. Shilton, 8·7 miles, was passed in 11 min. 56 sec., and Nuneaton, 14·5 miles, in 17 min. 37 sec., at 70 m.p.h. On the slight up-grades past Atherstone the rate fell to 63 m.p.h., but a further increase to 71 was registered at Tamworth, the 13 miles from Nuneaton to Tamworth occupying 11 min. 35 sec., and the 6·2 miles thence to Lichfield 5 min. 52 sec. The minimum beyond Lichfield was 54 m.p.h. and the maximum at Rugeley 66, so that Rugeley, 41·6 miles from the start, was passed in 43¼ min., Milford, 46·9 miles, in 48 min. 24 sec., and Stafford, 51 miles, in the extraordinary time of 52 min. 40 sec., instead of the 57 min. booked, the prescribed slack at Trent Valley Junction having been carefully observed. The highest speed attained on the rising grades to Whitmore was 56 m.p.h., and the minimum at the summit was 53 m.p.h., the 14 miles between Stafford and Whitmore occupying 16 min. 25 sec. A top speed of 74 m.p.h. was attained on Madeley bank, but adverse signals were encountered before Crewe, the 5·7 miles from Whitmore to Betley Road taking 5 min. 33 sec., and the last 4·8 miles into Crewe 6 min. 42 sec.

Even then, however, the Rugby-Crewe stretch of 75·5 miles had been covered in 81 min. 20 sec., the net time not exceeding 80¼ min., instead of the 87 min. allowed. Owing to the spending of overtime at Willesden and Rugby, the starts from both the places were 3 min. late, but the arrival at Rugby was punctual, and that at Crewe was nearly 2¾ min. early, as a result of this most praiseworthy work. As nearly as I can estimate, the equivalent non-stop time from Euston to Crewe with such running as this would be 165 min.—a remarkable enough feat in peace time, let alone in times and under conditions such as the present. And the present schedule time of some of the non-stop "expresses" is nearly a solid hour more than this! A friend of mine hazards the somewhat quaint suggestion that such times as the last-mentioned can only be maintained on the London and North Western Railway if the brakes are carefully applied on each falling gradient!

Proceeding now with our consideration of the table the next line in order of precedence, and in, perhaps, a rather unusual position, is the Great Eastern Railway, by virtue of a particularly brilliant "snippet" on the Southend branch, which has by some means escaped the high tide of deceleration on that section. First-rate though such a booking is, however, this is again, as in the case of the Great Northern Railway, a case of "appearances being deceptive" in comparison with the harder tasks embodied in certain other Great Eastern Railway schedules. For example, the 5.23 p.m. Cromer express *ex*-Liverpool Street, having now incorporated the 4.55 p.m. to Yarmouth, is booked to take a nightly minimum load of 13 bogies, often increased to 14 at week-ends, and occasionally to 15. On a recent Monday evening this train was made up to the last-mentioned load with a six-wheeler in addition, or 63 axles in all. The expresses due in Liverpool Street from the Cambridge line at 2.18 and 8.25 p.m. have booked loads of 13 bogies and a six-wheeler—55 axles—and 13 bogies respectively, and in each case, as that of the 5.23 p.m. down—on unaltered time schedules. These figures are eclipsed by the Saturday afternoon express from

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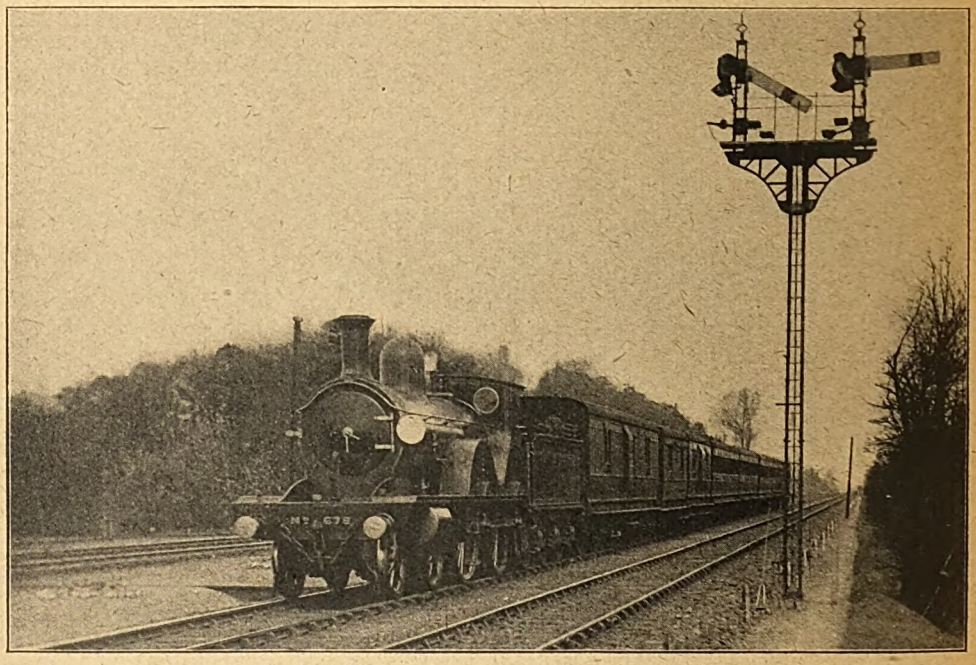
Liverpool Street to Cromer, Yarmouth and Lowestoft, whose booked weekly load is one of 14 vestibuled bogie cars.

At the time of writing I have just seized an opportunity of travelling by the last-mentioned train, and have been thoroughly well rewarded. Our engine to Ipswich was a 4–6–0 superheater—No. 1505—and the load behind the tender 56 axles, 368 tons empty, and about 390 tons with passengers and luggage. After getting through Bethnal Green in 3 min. 35 sec.—a very smart time for this 1·1 miles, which include ½-mile rise covering the 9·5 miles from Shenfield to the county town in 10 min. 35 sec., and then went up the brief rise beyond at a minimum rate of 52 m.p.h. On the undulations thence to Hatfield the speed ranged from 58 to 50 m.p.h., and then rose to 64½ again at Witham, the 8·9 miles between Chelmsford and Witham occupying 9½ min. On the ascent to Hill House—2 miles averaging 1 in 222—the lowest speed was exactly 50 m.p.h., and we were only fractionally below 60 when running through Mark's Tey, which was passed in 8 min. 35 sec. from



Photo] [*Miss D. D. Hoblyn.*

LONDON AND SOUTH WESTERN RAILWAY.

2.10 p.m. Down Bournemouth "semi-fast" passing Walton and Hersham.
Outside-cylinder 4–4–0 locomotive, No. 678.

at 1 in 70—we were most unfortunate in the matter of delays, being checked at Bow Junction, and again to walking pace at Western Junction, all but stopped at Aldersbrook, before Ilford, and checked again at Crowlands, near Romford, just when gathering speed for the ascent of Brentwood bank. I reckon that these hindrances cost us fully 10 min., at the very start of the journey, and on this account it took us 39 min. 50 sec. to get through Shenfield, 20·2 miles out of town.

But now the real interest of the run began. We sustained 64½ m.p.h. before Chelmsford, Witham (8 miles). The descent to Colchester was hampered by a permanent way check at Lexden viaduct, the 5·1 miles from Lexden to the stop consuming 6½ min., but even so we had covered the 31·5 miles from Shenfield in 34 min. 10 sec., or a fraction under 33½ min. net. Our time from Shenfield to Stanway Box, 28·8 miles, was 30 min. 5 sec., which is distinctly excellent work over a road such as the Great Eastern Railway with a 390-ton train-load. Thus, although the actual time to Colchester was 74 min., the net time was 63½ min., equivalent to a passing time of 62½ min., and 2½

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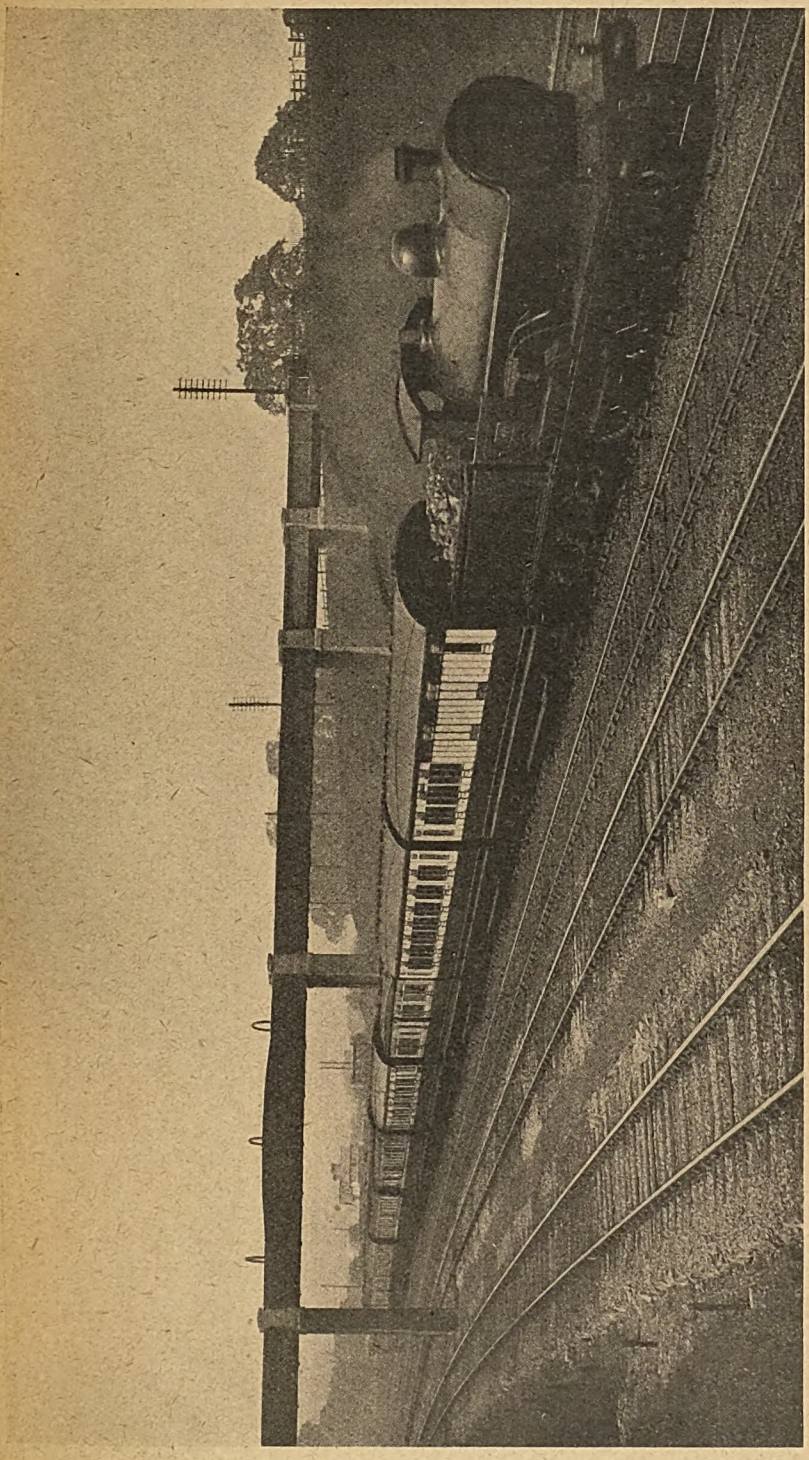

[*Photo*] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

Up Liverpool and Manchester Express. 4-4-0 locomotive, No. 1595, *Wild Duck*.

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min. under schedule, which is the fastest to Colchester now remaining.

At Colchester the load was reduced by the loss of the Clacton and Walton portion to the more manageable dimension of nine 8-wheelers, and a brilliant little run was made on to Ipswich with this 250-ton train, the start-to-stop time of 21 min. 5 sec. for these 17 miles being the fastest I have ever recorded. Speed fell to 32 m.p.h. on the 1½ miles at 1 in 141–123–144 from Colchester Junction, but rose to 69 m.p.h. at Manningtree, and the minimum at Belstead Box, after a mile up at 1 in 145 and 2 at 1 in 157 with an intervening level strip past Bentley, was 46 m.p.h. A rate of 67 m.p.h. was again reached before Halifax Junction. The time from Colchester to Manningtree, 7·8 miles, was 10 min. 35 sec., and from there to Ipswich 9·2 miles, 10½ min., the latter being a particularly "hot" record. So, inclusive of the permanent way check at Lexden, 3 min. were economised on schedule from Shenfield to Ipswich. By smart station work here this gain had expanded to 4 min. when we started again, with a much diminished load of 5 bogies, or 140 tons, behind No. 1519, another superheater 4–6–0 engine.

It would trouble any driver, one would imagine, not to gain at least a minute or two with a 20-axle load on such a schedule as 59 min. from Ipswich to Norwich, 46·3 miles—hilly though they are—and in point of fact we gained nearly 3, although the work was decidedly sluggish in all respects save uphill. We passed Stowmarket, 11·9 miles, in 15¾ min., at 56½ m.p.h., Haughley, 14·2 miles, in 18 min. 25 sec., and mile-post 84½, at the summit of Haughley bank, 16·8 miles, in 20 min. 40 sec. Two of the three steepest miles of this ascent are at 1 in 131, and on them we fell to exactly 40 m.p.h. But of the "galloping ground" from Finningham to Burston little use was made, the highest speed being 65 m.p.h. beyond Mellis, after which steam was shut off. So from mile-post 84½ to Diss, 11·5 miles, we took 11 min. 25 sec., and from Diss up to Tivetshall, 5·5 miles, 6¾ min., the lowest speed on this short rise being 43 m.p.h. We further took it quite easily on the undulating but favourable grades to Trowse Upper Junction, not exceeding the mile-a-minute rate anywhere except for a brief spell at 64 beyond Swainsthorpe. Thus the 12·3 miles from Tivetshall to the Upper Junction took 13½ min., but then, despite careful slacks at the Upper and Lower Junctions and the swing-bridge, we finished the last 2·2 miles rather briskly in 3 min. 50 sec., thereby completing the journey from Ipswich to Norwich in 56 min. 10 sec., and arriving only 3 min. late. This regaining of 7 min. from Shenfield on an unaltered schedule was a really excellent feat, but I am inclined to think that had No. 1505 remained with us, we should have regained the whole 10 min. of arrears.

I must not be tempted to describe my return journey from Norwich with the 3.27 p.m. up semi-fast, whereby we reached Liverpool Street a minute before time after some very smart running intermediately—but must hold this over, like so many other good things promised until a "more convenient season." Neither have I space left to dwell any further on the table, which, however, explains itself. It contains only one novelty, and that is the schedule of the 6.25 p.m. "diner" from Dublin to Dundalk of the Great Northern Railway of Ireland; this express now serves Drogheda by slip carriage and makes a very creditable run to Dundalk at a speed of nearly 51 m.p.h. In conclusion, the table and the foregoing particulars clearly show that there is still much of interest left in British express locomotive performance. "You railway enthusiasts," a friend in the United States wrote me recently, "should come over to the U.S.A. as a tonic. You can scarcely find a train here which averages 55 m.p.h., and few which do 50. England, though in the midst of war, still leads and really throws in the shade all countries in the matter of railway speed." I do not know whether my friend would have written in quite the same strain had he seen our January time-tables, but even yet we have much to be proud of and much to be appreciative of in the maintained express train services of our railways.

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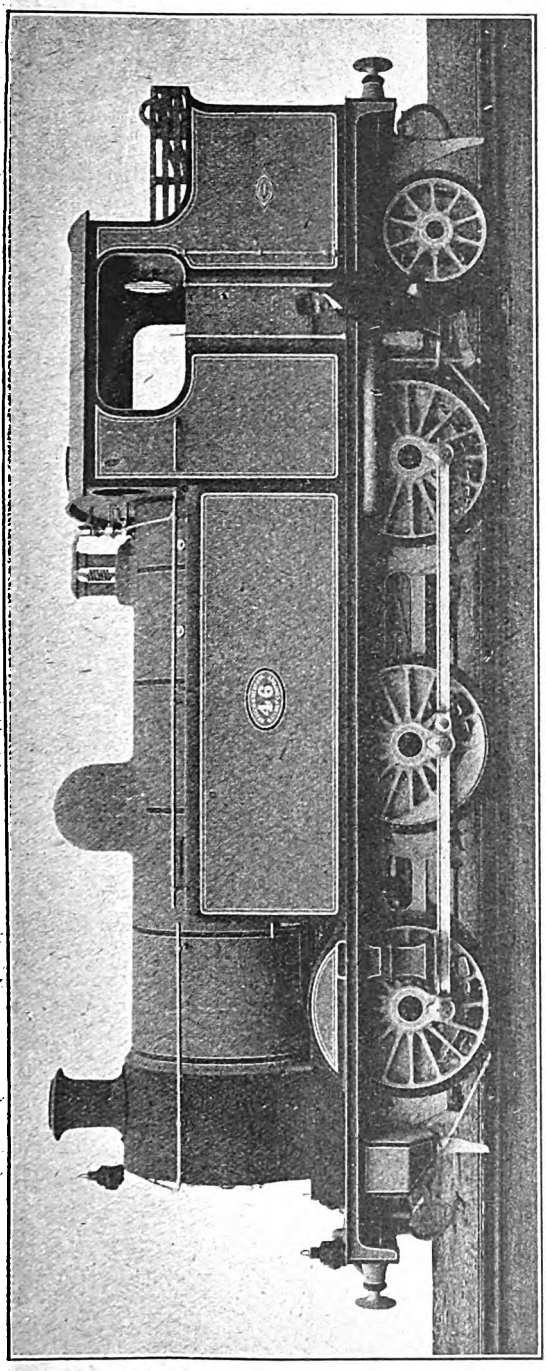
Six-Coupled Radial Tank Engine.

BRECON AND MERTHYR RAILWAY.



BUILT by Robert Stephenson and Co. from designs by Mr. James Dunbar, Locomotive Superintendent, Brecon and Merthyr Railway, the wheel arrangement of this locomotive is 0–6–2 and inside cylinders with Stephenson link motion are employed. This class of engine has proved very useful in Great Britain for working passenger or goods trains with equal facility. The utilisation of three pairs of coupled wheels of medium diameter, carrying a large proportion of the weight of the engine as adhesive load, combined with cylinders of suitable proportions and a boiler capable of supplying all the steam that is required results in the production of a type of locomotive powerful enough for all requirements and at the same time economical to build and maintain.

About 87 per cent. of the total weight is available for adhesion with a maximum axle load of 17 tons 12 cwt., and with the proportions adopted the engine develops a tractive force of 20,884 lbs. at 85 per cent. of total boiler pressure.

Principal particulars are :—

Cylinders, diameter ..	18 in.
Piston stroke ..	26 in.
Coupled wheels, diameter	5 ft.
Radial wheels, diameter	3 ft. 6 in.
Wheelbase, coupled ..	15 ft. 3 in.
,, total ..	21 ft. 9 in.
Heating surface, tubes	1,227 sq. ft.
,, ,, firebox	100 sq. ft.
,, ,, total	1,327 sq. ft.
Grate area	18 sq. ft.
Working pressure ..	175 lbs. per sq. in.
Weight in working order—	
Coupled wheels ..	52 tons 12 cwt.
Radial wheels ..	8 tons 8 cwt.
Total weight ..	61 tons.

Total water capacity of the tanks is 1,300 gallons, and the bunkers accommodate $2\frac{3}{4}$ tons of coal. Length over buffers is 34 ft. $5\frac{1}{2}$ in. The design presents a neat appearance, and the workmanship, materials and finish are all of the highest class.

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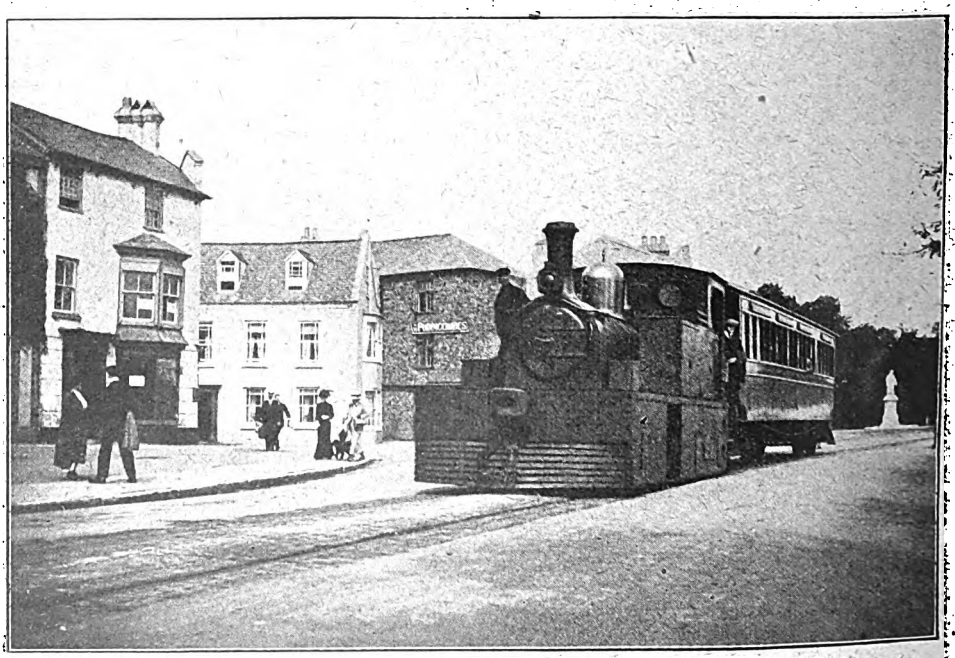
The Bideford, Westward Ho! and Appledore Railway.

BIDEFORD is reached by the London and South Western Railway but to explore further the land of "Westward Ho!" the services of this little railway must be enlisted. Incorporated as the Bideford and Westward Ho! Railway in 1896, the line was opened in 1901 to Northam, passing the growing resort alongside the famous pebble ridge referred to in Kingsley's great work and to which the name of Westward Ho! was given. The railway provided access not only to what was already a favourite place of resort in the district, but also to the now world-known links of the Royal North Devon Golf Club. In 1908 the extension to the old fishing and shipbuilding town of Appledore was opened.

Commencing on the Quay at Bideford, as the railway traverses a public thoroughfare, though only for about a quarter of a mile, it has to be treated as a steam tramway, the engines having their gear covered in and otherwise being suitably adapted. On this section the fireman stands on the front of the engine, when travelling chimney first, and rings a bell to give warning to pedestrians and others as may be required. The cars are long ones, somewhat of tramcar type, but considerably bigger, and are entered from end vestibules, with steps down to road level. Two generally constitute a train, reduced to one when that will suffice, but in the height of the summer three or four may be necessary. Three engines are in use. They are 2–4–2 side tank engines, built by the Hunslet Engine Co. Rolling stock is of semi-open type or can be closed in for winter use. First-class compartments are upholstered in leather. Some of the vehicles have double-faced clocks fitted in cross-members spanning the course of the roof. There are six passenger cars, one brake van, and eight goods vehicles. Passenger coaches are



Photo] [*F. H. Slingemore.*

TRAIN PROCEEDING ALONG THE QUAY AT BIDEFORD.

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TWO-CAR TRAIN ON QUAY AT BIDEFORD.
Kingsley statue in background.

generally very comfortable, and fitted with acetylene lighting. They have centre couplings combined with the buffers.

After traversing the Quay, which is left close to the Kingsley statue, the line crosses the public road to the depôt and, passing that, continues as a light railway on its own right of way. Once clear of Bideford, the line continues as single track, fringed by trees, gradually climbing to cross the summit before descending to the coast. At Abbotsham Road "halt" a diminutive signal provides for control of trains in crossing a public road. Over the summit, the line curves northwards and then comes out on a ledge on the hillside, giving a splendid view of the rocky coast as the train runs down to the station at Westward Ho! The town of Westward Ho! has the appearance of being built in tiers. The view from the summit is wild in its grandeur, with the rugged coast line, the rocks, the shingle beach and the wonderful pebble ridge, leading to the beautiful sands, far below. Refreshment booths are found on the beach, and bathing is good.

Here is a double-platformed station, on one platform of which is a refreshment room, and adjacent a concert hall where, in the season, high-class entertainments are run by the British Electrical Federation, under whose control the railway is placed. For these concerts combined rail and admission tickets are issued, following a policy adopted on the Rothesay Tramways and other lines under the same direction in various parts of the kingdom. Fêtes and ghymkanas are also arranged on suitable occasions.

At Appledore the line terminates in a small engine shed where one engine is kept overnight, when required, and the water crane is placed in this. The station is a neat erection among the steep streets of the old fishing port, and is close to the quay.

In a normal summer as many as 14 trains run each way daily, but the ordinary service is of 7 trains. Tickets are issued on the train by the conductors. Through bookings are also in force with the London and South Western Railway, and this also applies for luggage and parcels. Workmen's tickets are issued by the first up and down trains on week-days. Fares are very reasonable, the return from Bideford to Appledore being only 8d. (market tickets on Tuesdays and Saturdays 6d. return), and books of 10 tickets are sold for 3s. 4d. Between Bideford Quay and Abbotsham Road stations are halts at Strand Road, The Lane, Causeway, and Kenworth Castle. Before Westward Ho! is a halt at Cornborough, while beyond is one at Beach Road. Between Northam and Appledore are halts at Richmond Road and Lovers' Lane.

Mr. H. Sowden is responsible for the management. He was for 13 years in the traffic department of the Somerset and Dorset Joint Railway, and has been in

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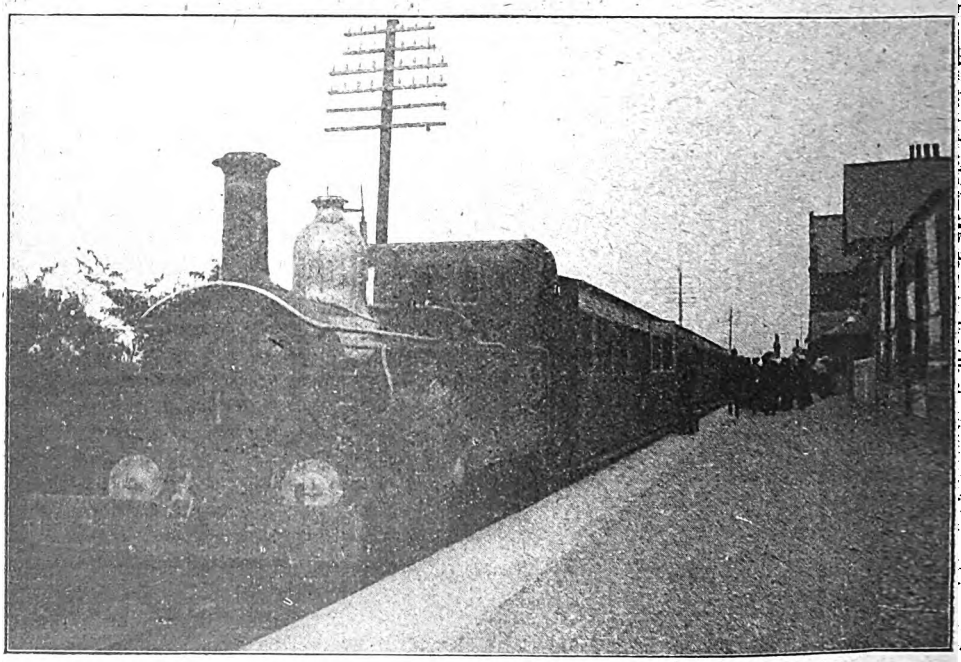
charge of the Westward Ho ! line ever since its opening. He was also responsible, as engineer, for the extension from Northam to Appledore.

In conclusion we may quote one of the "Homeland" series of guide books, in view of its references to this interesting little line. Says the author, Mr. Dudley Clark, "It is not always easy to give praise to a railway, but the Bideford, Westward Ho ! and Appledore Railway, in spite of its high-sounding title, is singularly modest and unobtrusive. To be sure it is well in evidence at Westward Ho ! having a station on the front, but elsewhere it comes as a surprise to the walker along the lanes around Abbotsham and Kenwith. It is well worth taking the full trip of half-an-hour's duration if only for the sake of the scenery, which changes as rapidly as it unfolds ; now, as Appledore is left, the broad expanse of the golf links, now a burst of tumultuous sea as the train takes the sharp bend past Westward Ho ! now a tunnelling amid deep tree shadows at Abbotsham and Kenwith, through the marshy meadow land behind Bideford, and finally the pleasant Torridge on our left as we run on to the quay by Kingsley's statue. The line is some seven miles long, with termini at Bideford and Appledore. There is a suggestion of primitiveness about the curious little engine, boxed in as it is down to the rails, in order that dogs and cattle may not attempt suicide by running beneath. Halts are provided in addition to the principal stations, and armed with a time-table the pedestrian will often find it possible to make a swift and agreeable termination to his walk."

A RAILWAY SCENE IN MANXLAND.



Photo] [*Cecil E. Green.*

PORT ST. MARY STATION: ISLE OF MAN RAILWAY.

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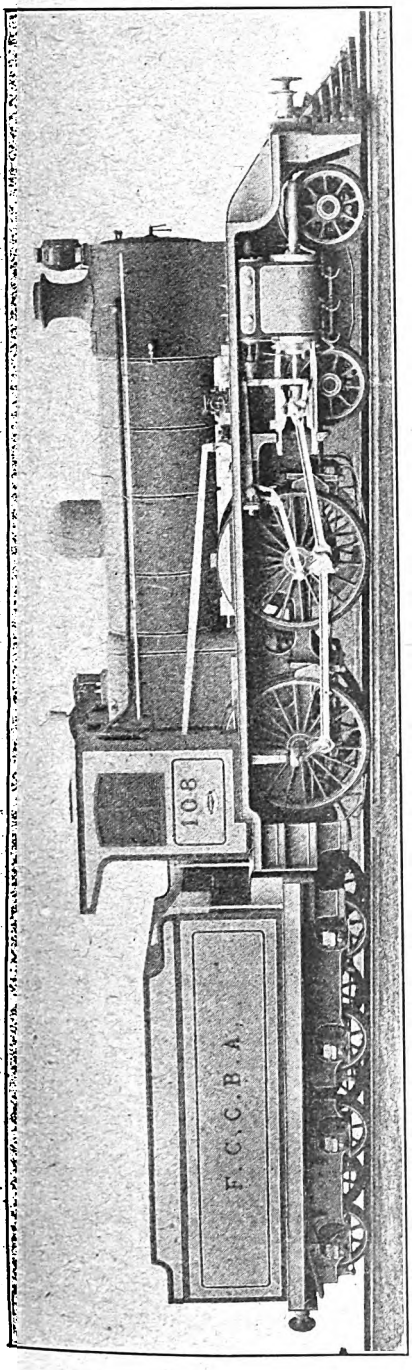
Passenger Locomotives for the Central Railway of Buenos Aires.



SUPERHEATED 4-4-0 TYPE PASSENGER LOCOMOTIVE, CENTRAL RAILWAY OF BUENOS AIRES.

THE locomotive illustrated is one of a series of eight designed and constructed for the Central Railway of Buenos Aires by Messrs. Kerr, Stuart & Co., Ltd. Fitted with superheaters, and steam distribution effected by means of piston valves actuated by Walschaerts' gearing, the engine is of the 4-4-0 type with outside cylinders. The boiler is equipped with the Belpaire type of firebox, the construction being of steel throughout. Boiler plates are of steel $\frac{7}{16}$ in. thick, and there are 110 solid-drawn steel tubes $1\frac{3}{4}$ in. external diameter. Working pressure of the boiler is 160 lbs. per sq. in.

Provided with a double roof and brass framed windows in front, the cab has louvred shutters at the sides. Equipment includes Wakefield mechanical lubricators and steam sanding gear delivering sand in front of the driving wheels and at the rear of the trailing wheels. A Hasler speed indicator is fitted. The smokebox contains a spark arresting device.

Main particulars are as follows :—

Cylinders, diameter	16 in.
Piston stroke	24 in.
Wheels, coupled, diameter	5 ft. 8 in
„ bogie, diameter	3 ft.
Wheelbase, coupled	7 ft. 6 in.
„ total	20 ft. 7½ in.
Heating surface, tubes	567 sq. ft.
„ „ firebox	91 sq. ft.
„ „ total	658 sq. ft.
Superheater surface	216 sq. ft.
Heating surface, total	874 sq. ft.
Grate area	17 sq. ft.

In working order the engine weighs 40 tons 14 cwt. Tender is of the eight-wheel double-bogie pattern, with accommodation for 2,500 galls. of water and a fuel space of 225 cubic ft. Total weight of engine and tender when loaded is 75 tons 12 cwt. Screw reversing gear is fitted on the right-hand side of the engine. Although the engines are not of large size for the 4 ft. 8½ in. gauge, they are of a compact and well-proportioned character, and present a neat and symmetrical appearance.

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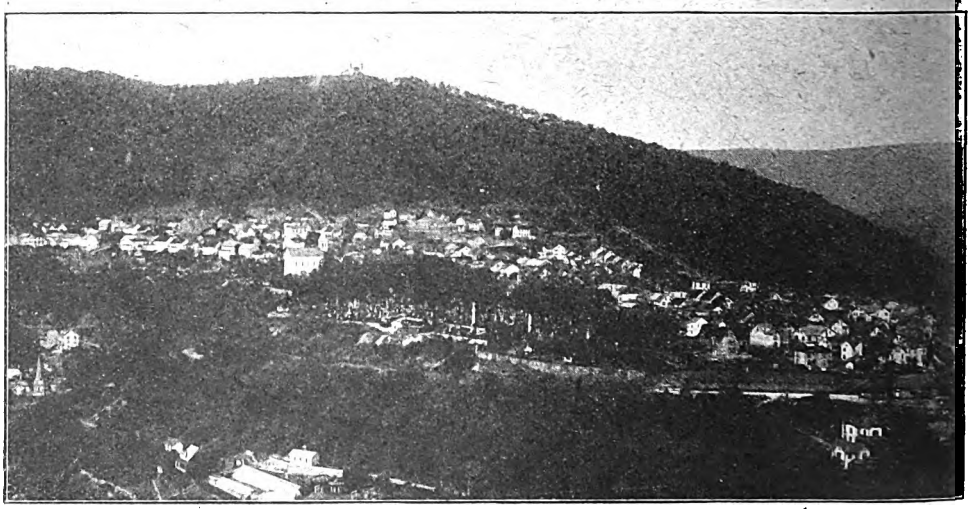
The Oldest Railroad in America.

A Successful Switchback.

By R. W. A. SALTER.

MAUCH Chunk Switchback Railway, in Pennsylvania, is said to be the oldest railroad in America, while it is also claimed that it was the first road to have been laid with the aid of an instrument—the level. Between 1818–19 it was graded, with the intention of opening for business as soon as conditions warranted the expenditure of laying rails. In January, 1827, tracking was commenced, and the following May it was completed and the railroad in operation.



MAUCH CHUNK, SHOWING SUMMIT OF MOUNT PISGAH AND TRESTLE IN MIDDLE BACKGROUND.

The work then conducted consisted solely in transporting coal between Summit Hill and Mauch Chunk by means of gravity, the empty cars being returned to the mines by mules, who rode down in their own cars with the coal. Thus about one thousand tons of coal were carried per day.

It was in the vicinity of Summit Hill that anthracite coal was first discovered. Philip Ginter, an old hunter, uncovered the first seam, and began the undertaking that has now attained such large proportions. For a time the coal was carried in the manner as already referred to; but in 1844 the planes—viz., Mount Pisgah and Mount Jefferson—were built in order that empty cars might be hauled back to Summit Hill by steam power. That is, they were hoisted up these planes and ran the balance of the distance by gravity.

In about 1870 the road was devoted to pleasure purposes exclusively, the coal being carried from Summit Hill over the steam railways by way of Lansford. The popularity attending this innovation was very gratifying to the promoters, and, now, thousands of tourists take the ride every summer.

Some sections of rail which were imported from Great Britain about 1827 are still in existence. They are in segments of about 4 ft., a necessity for rounding the sharp curves, and were probably the first rails to be used in America.

By taking an electric car, the passenger,

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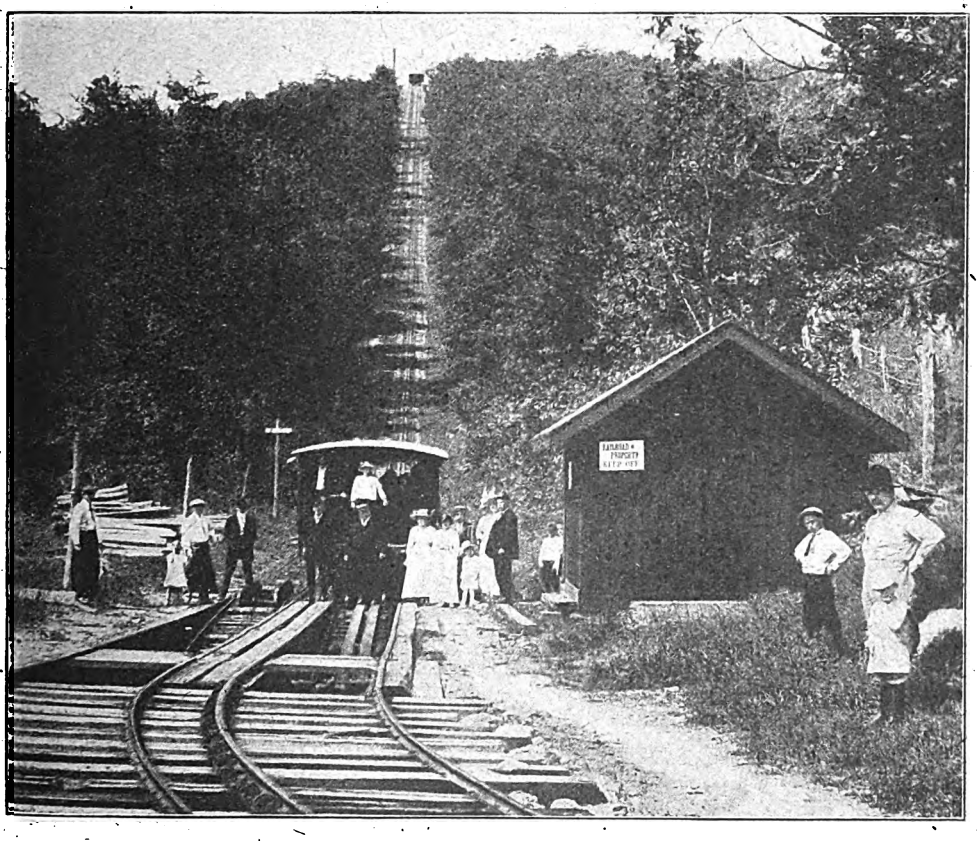
after a most pleasurable ride through Mauch Chunk and up the mountain side, arrives at the switchback station. Here he takes his seat in one of the open switchback cars, which, the brakes being released, runs by gravity to the foot of Mount Pisgah Plane.

The system of working the plane is quite interesting, and it is the same in the case of Mount Jefferson. It is 2,322 ft. in length, with an elevation of 664 ft., being a rise of about 1 in 3. There are two tracks, and upon each runs a barney or safety car, to which is



MOUNT JEFFERSON PLANE.

attached two heavy steel bands, each 6½ in. wide. These bands are fastened to iron drums, 28 ft. in diameter, in the engine house at the head of the plane; the motive power being two stationary engines of 120 H.P. each.

It will be noticed in the accompanying illustration of Mount Jefferson Plane that there are pits between the tracks. Out of these are drawn the steel bands referred to. The wheels and axles on the barney car are so arranged that as they emerge from the pit the gauge of the barney car widens by means of separate axles to each wheel, which work automatically, so that it runs up the same track as the passenger car. A corresponding barney car descends the plane on the opposite track, and when it reaches the pit, the automatic axles which were expanded for the wide track converge, and it runs into the pit ready to hoist the next passenger car, which runs immediately over it by gravity. This mechanism has been in operation for over 75 years, and is pronounced by engineers of the present day to be quite a marvellous feat.

In connection with the mechanism is an arm extending from the barney car which runs over a ratchet between the two tracks all the way to the top of the plane, and being so arranged that if any mishap should occur to the machinery, or the steel bands, any backward motion will set the arm of the ratchet and hold the load in position at any

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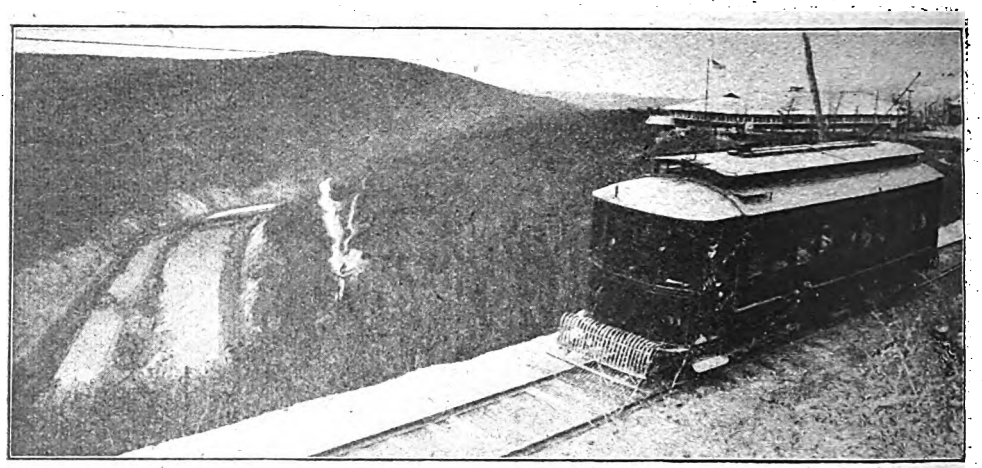

FLAGSTAFF PARK AND MAUCH CHUNK, SHOWING VALLEY IN THE DISTANCE, 900 FEET BELOW.
The park is 1,600 feet above sea level and is reached by electric cars.

portion of the plane. During its operation as a pleasure road the Mauch Chunk Railway has never had a fatal accident. Car may have stopped on the planes for some reason, but in all cases the safety appliances have proved adequate.

The signal is given to the engineer at the head of the plane, the barney car is drawn slowly from the pit, and the train begins to ascend until the summit, nearly 900 ft. above the starting point, is reached.

As the switchback cars pass over the trestle at Mount Pisgah, a magnificent view of the surrounding country unfolds itself.

From the starting point—Mauch Chunk—to Summit Hill, the vertical lift is about 1,000 ft., so that in returning from Summit Hill to Mauch Chunk the cars drop about the same distance; but, as the grade is so uniform, being about 100 ft. to the mile, the cars run evenly and safely.

The ever-changing scenery viewed from such a high elevation renders the trip one that is permanently impressed upon the mind. The ride down the Home Stretch is 2½ miles straight away. Both sides of the track are lined with green foliage. At this point the cars attain a velocity of 60 miles per hour.

Another feature of interest in Mauch Chunk is Flagstaff Mountain, which rises nearly 900 ft. abruptly from the Lehigh River opposite Mount Pisgah, and directly across the gorge from the nose of Bear Mountain, upon which is situated Flagstaff Park. The park is 1,600 ft. above the sea level, overlooking a magnificent view, and is reached by the electric cars of the Carbon Transit Company, winding up through picturesque West Broadway, which cars connect with the steam roads and the switchback.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

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British Railway Service and the War. [XIV.]

IT is to the railway industry more often than to any other that the British Government turns when it requires a man of real capability to see a business matter through. Other sections of commercial life have, of course, supplied leading men for important war time appointments, but it is in the railway world that the powers that be find the most fruitful field when men of real executive ability are in demand.

To the long list of leading railway officers who are now serving the nation in spheres other than railway work must be added Mr. R. H. Selbie, General Manager, Metropolitan Railway, who has become chairman of a Committee formed at the instigation of the War Cabinet through the Board of Trade to deal with the utilisation and feeding of horses. One branch of the work of the Committee will be the co-ordination of carrier and delivery services not only in the metropolitan area but in all parts of Great Britain.

In the May RAILWAY MAGAZINE the appointment of Sir Eric Geddes, Deputy General Manager, North Eastern Railway, as Inspector-General of Transportation in all theatres of war, was recorded. Since the publication of the May number Sir Eric has had the honour of being received by His Majesty the King at Windsor Castle, and it has been announced that he has accepted a new appointment at the hands of the Government. It is stated that he will be responsible for the organisation of a ship-building movement closely resembling the munitions campaign which the Prime Minister himself inaugurated two years ago. Sir Eric will hold the temporary rank of Vice-Admiral.

LONDON, BRIGHTON AND SOUTH COAST RAILWAY ROLL OF HONOUR.

Up to the end of April, 1917, no fewer than 4,276 men from this southern railway had enlisted, and 239 had given their lives for their King and Country.

Mr. H. M. Bowden, Audit Accountant, Great Central Railway, has obtained a portrait of each member of his staff who has joined the Naval and Military Forces. He has had them put into one large group picture, the size being 58 in. by 37 in. and placed in the Entrance Hall of the offices at 34, London Road, Manchester.

The group contains 92 members, representing about 90 per cent. of the total staff of military age and at the foot is an alphabetical list of the names and rank of each person.

Quite a number of military men who in civil life were members of the Great Central Railway Audit Staff have obtained advancement, and in the case of Company Sergt.-Major H. E. Cooke, his promotion was granted following special commendation by the Brigadier General for "conspicuous gallantry in the field." It is pleasing to know that of the 92, eight are 2nd Lieutenants, one R.Q.M.Sergt., two Company Sergt.-Majors, nine Sergts. and 20 other N.C.O.'s.

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Five of the total number have been killed or died of wounds, etc., viz., L.-Corpl. S. E. Green killed in France July, 1916; Sergt. H. E. Colville died from wounds August, 1916; Pte. J. P. Wild died from wounds February, 1917; L.-Corpl. R. L. Smith died from wounds February, 1917, and Gunner G. F. Taylor contracted pneumonia in France which proved fatal in March, 1917.

A recipient of much condolence has been Mr. H. C. Law, who recently retired from the position of Great Western Railway District Goods Manager for London. His son, 2nd Lieut. Henry Milner Law, has been killed in action. He was in his twenty-sixth year, and had been in the Great Western Railway service nine years, first in the Chief Goods Manager's Office and subsequently in the Goods Department at Slough and Southall. He enlisted in September, 1914, as a private, and from the ranks was advanced to a sub-lieutenancy.

LOCOMOTIVE BOILER SHOP ROLL OF HONOUR, STRATFORD WORKS, GREAT EASTERN RAILWAY.

Another Great Western Railway clerk who enlisted in September, 1914, and was afterwards rewarded with a commission was 2nd Lieut. Joseph Mockford. He, too, has fallen in action. Prior to joining the Army he was in the Chief Goods Manager's Office, Paddington, and had been in the Great Western Railway service about seven years.

Outside the Midland Railway station at Derby a Y.M.C.A. hut was recently opened by the Countess Curzon of Kedleston. Mr. G. Murray Smith, Chairman, Midland Railway, sent a letter regretting enforced absence and stating that it had been a great pleasure to the Company to lend a site for the hut for the use of soldiers. The Midland Railway subscribed money for a hut in France in the early days of the war and they were gratified to hear of the manner in which it had been appreciated.

Formerly a clerk at Thurnscoe station, Hull and Barnsley Railway, Corpl. R. H. Spencer, R.E., of Goldthorpe, has been awarded the Military Medal for gallantry displayed in circumstances officially narrated as follows: "On February 25th, 1917, this non-commissioned officer was in charge of a visual station in a shell hole in the vicinity of Beaumont Hamel. His station was observed by the Germans and shelled. Although it was plainly evident that the signalling was attracting shell fire, he continued his work, and, as the only other possible means of communication was by runners, until the night of the 26th he was the means of keeping up rapid communications between Brigade headquarters and battalions during a period when intercommunication was of special importance. By his example he greatly encouraged other signallers to continue their work in spite of heavy fire."

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As becomes the "premier" British line, the London and North Western Railway continues to provide a growing list of military honours won and promotions gained by members of its staff who have entered the armed forces of the Crown. Among these is Captain W. Stanley Hughes. Prior to enlisting he was attached to the staff department of the District Traffic Superintendent at Chester. As long ago as January, 1916, he was granted a commission in the Royal Naval Division, but since then his ability has proved worthy of promotion, and he has been gazetted Captain and transferred to the Cameronian Rifles.

Rifleman G. C. Lewis, of the Goods Department, Shrewsbury, has been awarded the Military Medal, but unfortunately as the result of a severe wound he has lost his right arm. The circumstances under which he gained his well-earned honour are set forth in the following extract from a letter from his Officer Commanding: "Rifleman Lewis was granted the Military Medal for continued excellent service in front line observation which is one of the most onerous and important duties in trench warfare; one post which I found for him in the Ypres Salient some 14 months ago was officially known afterwards as 'Lewis Post,' owing to the important observations obtained from it."

Another London and North Western Railway man who has gained honour is Corporal Owen Martin, of the Goods Department, Holyhead. "For distinguished and conspicuous bravery" he has been awarded the Meritorious Medal.

Like other railways, the London and North Western line is losing many promising and rising members of its staff while on military service. Prominent among recent announcements is the death in France of Captain James Norquoy, of the Middlesex Regiment. He was well-known and highly regarded at Euston. He joined the forces in the early days and was soon selected for promotion.

How greatly the British railway service has contributed to the armed forces of the Crown is demonstrated by the number of men from each of the railways in England, Scotland and Wales, who had joined the Colours to March 31st, 1917, the latest date for which such figures are available from all sources.

Alexandra (Newport and South Wales) Docks and Railway	318
Avonmouth Light	2
Barry	610
Brecon and Merthyr	78
Burry Port and Gwendreath Valley	9
Caledonian	3,919
Cambrian	366
Cardiff	581
Cheshire Lines Committee	982
Cleator and Workington	36
Cleobury Mortimer and Ditton Priors Light	5
Cockermouth, Keswick and Penrith	18
Colne Valley and Halstead	24
Easingwold	1
East London	37
East and West Yorkshire Union	10
Festiniog	11
Furness	378
Glasgow and South Western	1,836
Great Central	8,017
Great Northern	7,350
Great Eastern	7,242
Great North of Scotland	460
Great Western	20,988
Highland	411
Hull and Barnsley	1,107
Isle of Wight	49
Isle of Wight Central	51
Kent and East Sussex	15
Knott End	4
King's Lynn Docks and Railway	12
Lancashire and Yorkshire	8,225
Liverpool Overhead	65
*London, Brighton and South Coast	4,209
London and North Western	24,386
London and South Western	4,796
Lynton and Barnstaple	12
Maryport and Carlisle	87
Mersey	118
Metropolitan	948
Metropolitan District	2,448
Midland (Tilbury section)	16,227
,, and Great Northern Joint	637
,, and South Western Junction	108
Mid-Suffolk	11
Neath and Brecon	48
North British	3,398
North Eastern	14,254
North Staffordshire	1,040
Plymouth, Devonport and South Western Junction	5
Portpatrick and Wigtownshire Joint	74
Port Talbot Railway and Docks	134
Railway Clearing House	1,206
Rhondda and Swansea Bay	35
Rhymney	334
Shropshire and Montgomeryshire Light	10
Somerset and Dorset Joint	281
South Eastern and Chatham	3,744
Southwold	1
South Yorkshire Joint	9
Stratford-on-Avon and Midland Junction	47
Taff Vale	958
West London Extension	7
Wirral	48
Total	142,862

* Later London, Brighton and South Coast figures are given under illustration on page 411.

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Women employed at the same date on the English and Scottish lines was 54,267. It may be added that since March 31st many more men have joined the colours and although still more women have entered the railway service the latter is still considerably under-staffed, a circumstance all traders and railway travellers will do well to bear in mind.

As we go to press official announcement is made that the British railway industry has arranged to release a further 21,000 men for service with the Colours.

In obtaining the Military Medal Great Eastern Railway men are well to the fore. Among the latest announcements are: Mr. H. Vandome, goods porter, Bishopsgate, for maintaining telephonic communication under shell fire at Vimy Ridge; and Sergeant J. B. H. Buck, booking clerk, Theydon Bois, for gallantry in removing signalling head-quarters under heavy fire.

From the locomotive boiler shop of the Great Eastern Railway at Stratford Works have gone over 70 of the staff to the fighting forces, and the remaining shopmen are rightly proud of their Roll of Honour, which by courtesy of the *Great Eastern Railway Magazine*, we are able to illustrate. Particularly pleased are the shopmen with the reflected glory of the gallant deeds of Corporals Victor Bloomfield and Walter Rickett. Bloomfield is 24 years of age, and served his apprenticeship in the shop. In November, 1915, he joined the Essex Regiment and was soon in France. During some operations on the Ancre all his company officers were killed or wounded and Bloomfield took charge, showing such resourcefulness that he was recommended for a commission. He is now undergoing training for this. Rickett is also 24 years of age and was likewise an apprentice in the shop. He displayed great gallantry whilst carrying despatches, for which he has received the commendation of the divisional commander, followed by promotion and the award of the D.C.M.

Speaking at the Mansion House, London, on Saturday, May 12th, General Sir William Robertson, Chief of the General Staff of the British Army, paid a well-deserved tribute of praise to British railwaymen who have gone to France. Sir William remarked: "The use of enormous masses of heavy artillery has rendered the preparation for battle a long process, calling for the most rapid system of communication and transportation and demanding the very highest qualities of organising power in general. During the last five or six weeks we have expended no less than 200,000 tons of munitions in France alone, and we took out some 50,000 tons of stone for making and mending roads. All these things mean a tremendous amount of railway work. And in this connection I would like to acknowledge the most valuable services rendered to the Army by the railway managers and the railway employees who have gone out from this country to do that work for us in France. No word of praise is too high for the skill and determination these men have shown."

From the Cottonera Hospital (Camp), Malta, comes the suggestion that there may be RAILWAY MAGAZINE readers who would like to send their monthly copies there after they, themselves, have done with the magazines. We are assured that there are invariably soldiers in the hospital who are enthusiastic students of railway affairs, or who were in railway employment before entering military service. But whether one thing or the other the men are equally keen on securing copies of the RAILWAY MAGAZINE and deeply grateful to the senders.

DON'T FORGET
YOUR FRIEND
IN THE FORCES.
SEND HIM A
RAILWAY MAGAZINE.

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An Indian Mountain Railway.

THE NILGIRI LINE.

THIS railway possesses some remarkable features, not the least being that an intermediate section of the system is operated as a rack railway. Extending from Mettapollium, a station on the South Indian Railway, to Ootacamund, it was the first railway in India to be constructed on the Abt rack rail system, and it is worthy of note that the whole of the original material was exported from Great Britain. Constructed in 1897 and purchased by the Indian Government in 1903, it was at first operated as part of the old Madras Railway, but on January 1st, 1908, portions of that line being transferred to the South Indian Railway, the working of the Nilgiri line has since then been undertaken by the latter company. At that time the Nilgiri Railway terminated at Coonoor, 16¾ miles from Mettapollium, but in October, 1908, an extension of 12 miles to Ootacamund was completed and opened for traffic. Thus the system is now 28¾ miles in extent, of which 12 intermediate miles are operated as a rack railway, and the remainder as an ordinary adhesion railway.

Starting at Mettapollium, the line attains an altitude of 5,613 ft. above sea level at Coonoor, 7,275 ft. at the summit at Ferryhill and 7,228 ft. at the Ootacamund terminus. The line is laid to the metre gauge (3 ft. 3⅜ in.), with 50 lb. flat bottomed rails, the minimum radius of the curves being 328 ft. From Mettapollium to Kullar, the first intermediate station, a distance of 4¾ miles, the railway is an ordinary adhesion one,

TRAIN RUNNING BETWEEN METTAPOLLIUM AND KULLAR.
"R" class, 2–4–0 engine built by Beyer Peacock & Co., Ltd., 1897.

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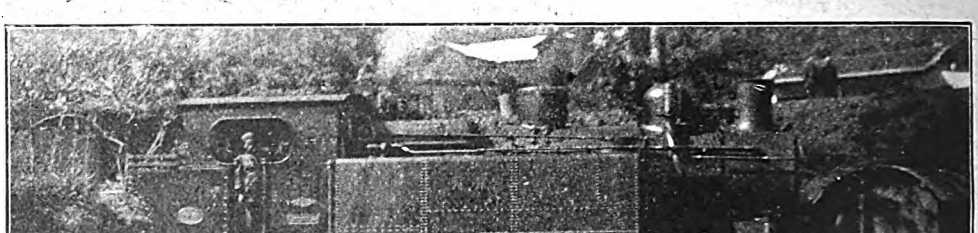

COMBINED RACK AND ADHESIVE ENGINE.
"P" class, 0-8-2; built by North British Locomotive Co., Ltd., 1911.

with maximum gradients of 1 in 40, but at Kullar the rack section commences, and extends for 12 miles to Coonoor on a ruling gradient of 1 in 12½. At the four intermediate stations on this section the track is level, and laid without the rack, so that ordinary points and crossings may be used. From Coonoor to Ootacamund ordinary adhesion working is reverted to, but on grades as severe as 1 in 25.

Ootacamund is situated on the plateau of the Nilgiri Hills, over 7,000 ft. above sea level, and the principal ghat by which this plateau is reached is a steep valley with precipitous sides, some six miles long. In these circumstances it was not possible to construct an ordinary adhesion railway without making use of several reversing stations, a course which was not recommended; and finally a rack railway on the Abt system was decided upon.

As may be imagined, the situation of the Nilgiri Railway, located as it is in most difficult country, made surveying and building very formidable tasks. The survey of the original portion of the line was commenced at the Coonoor end and carried down the valley, it being found necessary only to run a falling grade-trace at the pre-determined gradient of 1 in 12½ until it reached the bottom, using *en route* any side valleys to gain distance where the slope of the ground exceeded the proposed gradient. At several places the ground was very difficult and inaccessible; as, for instance, at the Benhope Cliffs, where the railway runs for 1,000 ft. along the face of a nearly vertical cliff 2,000 ft. high, and the Burliar Valley, where it crosses a gorge by a bridge 150 ft. long and 120 ft. high, and then immediately enters a tunnel in the face of the cliff. If surveying was a laborious undertaking, building the line was even more so, but eventually all obstacles were successfully overcome.

The difficulty of constructing the Burliar Valley bridge, which, as just mentioned, is immediately succeeded by a curved tunnel 275 ft. long in the face of the cliff, was ingeniously met. One girder, of a length of 80 ft. and on a 328 ft. curve, spanned a gorge 120 ft. deep, and it was thus impossible to make use of derricks for erection. Near the bottom of the gorge a temporary bridge was put down, and on it was built a timber staging nearly 60 ft. high. On top of this staging temporary rails were laid, and the girder, which had already been riveted up, was run out of the tunnel on bogies and made fast to the central stone pier previously erected.

Some idea of the magnitude of the works on the Mettapollium–Coonoor section will be gained when it is stated that there are no fewer than 136 bridges, 120 retaining walls and nine tunnels—the latter, however, are very short, the longest one being but 325 ft. The biggest retaining wall is 200 ft. long and 63 ft. high, whilst the longest bridge—that over the Kullar river—measures 450 ft.; this is a three-span bridge, approached by arched viaducts at either end.

Locomotives in use on the Nilgiri Railway are of five different classes, four of which are of the combined rack and adhesion type. They may be classified as under:—

"R" class, 2–4–0 type, built by Beyer Peacock and Co. in 1897. Outside cylinders, 11½ in. by 18 in. for driving the adhesion

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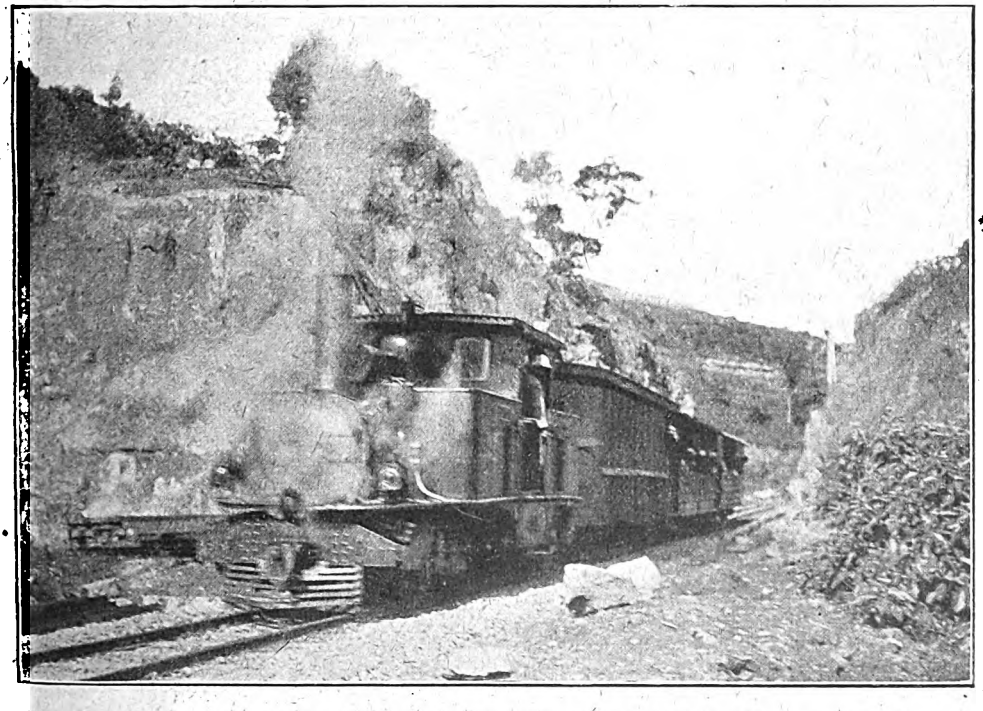
wheels, and inside cylinders, 10 in. by 14 in. for the rack pinions. All wheels are 2 ft. 6 in. in diameter, the trailing pair being coupled. Wheelbase, 10 ft. Working pressure, 180 lbs. Weight, 33 tons. One of these engines is shown on the train running between Mettapollium and Kullar (page 415).

"S" class, 0–6–2 type, built by the North British Locomotive Co. in 1905. Cylinders (outside), 14¾ in. by 16 in. Cylinders (inside), 16½ in. by 14¼ in. Working pressure, 180 lbs.

"P" class, 0–8–2 type, built by the North British Locomotive Co. in 1911. Cylinders (outside), 16½ in. by 16 in. Cylinders (inside), 16½ in. by 14¼ in. Working pressure, 180 lbs. This class is illustrated on page 416.

For working on the adhesion section between Coonoor and Ootacamund, there are three Fairlie (0–4–4–0) engines built by the Avonside Engine Co. in 1881 for the North Western State Railway, and purchased for the Nilgiri Railway in 1908. They have cylinders 11 in. by 17 in., coupled wheels 3 ft. in diameter, a boiler pressure of 180 lbs., and a total weight of 32 tons. These engines being now 36 years old are probably withdrawn from service.

The latest engines (class "X") are remarkably powerful machines, being four-cylinder compounds with the 0–8–2 wheel arrangement. They were built in 1914 by the Swiss Locomotive and Engine Works at Winterthur, and are therefore the first Nilgiri engines to be constructed outside England. They can be worked as either single expansion or compound engines, compounding being necessary when running on the rack portion of the railway. All four cylinders are outside the frames, the upper pair driving the rack mechanism, and the lower pair the adhesion wheels. They are all of the same diameter—17¾ in.—but the lower, or high pressure pair, have a slightly longer stroke, viz., 17 in. as against 16½ in. in the case of the low pressure pair; the relation of the cylinder volume for compounding being obtained by the relative dimensions of the intermediate spur wheel of the low pressure mechanism. The rack mechanism consists of two double toothed wheels and axles supported by the main frames, driven by pinions coupled together and operated by the low pressure cylinders. The eight coupled wheels are 2 ft. 9 in., and the trailing wheels 2 ft. 4 in. in diameter. The heating surface is 1,119 sq. ft., and the working pressure is 200 lbs. Superheaters are provided, and when fully loaded the engines weigh 49 tons.



TRAIN BEING PUSHED UP TO OOTACAMUND STATION BY FAIRLIE ENGINE.

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TRAIN AT OOTACAMUND STATION.
0-4-4-0 Fairlie engine.

All trains on the Nilgiri Railway are "mixed." On leaving Mettapollium the engine pulls the train in the ordinary way, but at Kullar, the next station, where the rack portion commences, the engine runs round to the rear of the train and pushes it to Ootacamund. It was formerly the practice for the combined rack and adhesion engines to be changed at Coonoor, where the rack section finishes, one of the Fairlie simple adhesion engines taking the train forward to Ootacamund, but as the latter engines are now probably out of service, the "combined" engines work the trains throughout, from starting point to destination.

Rolling stock of the Nilgiri Railway comprises about 100 vehicles, both passenger carriages and goods wagons being carried on four-wheeled bogies. The workshops and engine shed are situated at Coonoor.

THE study of railways and their working fascinates a good many people, and all who have ever yielded to it, either as a duty or a hobby, know that THE RAILWAY YEAR BOOK (2s. 6d.) is the Koran to this religion. It tells about the various railway systems, and nowhere can the reader learn so readily their history and territory, the plan of their lines—in fact, all about them and the former characteristics are preserved, while the war-time effect upon the working of railways is fully recorded.—*The Globe.*

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, neither should queries be of purely local interest. Before asking for information concerning railway history and the like, RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book" (2s. 6d. net), the twentieth annual Edition of which is on sale.*

London and North Western Locomotive *Cornwall.*

Numerous letters have been received at the RAILWAY MAGAZINE offices concerning the recent doings of this famous engine. Commenting upon some of the statements made, our Crewe correspondent says:—"The facts are the Chief Mechanical Engineer, Mr. Bowen Cooke, having had little or no work lately for this engine to do (it had been attached to his private coach since its reappearance in May, 1911) decided to give it a trial as a motor engine, and for this purpose it was duly fitted up and put to work as such between Nantwich and Northwich at the end of February. It was soon apparent that the *Cornwall*, with its single 8 ft. 6 in. drivers, could not be controlled properly when worked other than from off the footplate, consequently not proving a success in this direction it was withdrawn and is again once more attached to Mr. Cooke's private saloon. The *Cornwall*, as she now is, looks very fine with her polished brass dome. One of the men who had charge of her when she was in service recently, told me it was forty years since he last drove the *Cornwall*; it was then stationed at Whitchurch, and ran daily down to Manchester. The *Cornwall* was replaced in March, 1886, by the three-cylinder compound *City of Manchester*, which in turn was replaced in September, 1904, by a four-cylinder compound goods, both these engines being now 'scrapped.' It is curious that the *Cornwall* should have out-lived them both."

[Reply to EDWARD E. ROBINSON, JNR., AND OTHERS.]

Boiler Washing Systems.

Most of the patents for the treatment of locomotives by hot water were of American origin, although there were some early English patents, but they were not what is termed complete systems. In a paper read before the Institute of Locomotive Engineers some two years ago Mr. South dealt with some of the early patented devices. The first real invention for a hot-water boiler-washing plant was taken out in 1886 by a Canadian locomotive engineer named Robb. His apparatus consisted of a tank which he filled with cold water from any ordinary supply. He put a pipe connection from this tank through a coil in a sand furnace and back to the tank thereby heating the water therein. He provided pipe connections round the engine shed through which he blew the steam out of the boiler into the tank, thereby heating the water therein still further. He then emptied the boiler into the sewer and used the hot water out of the tank for washing out and re-filling. He put down a steam-driven pump to pump the hot water from the tank to the wash-out and re-filling pipes. Robb advanced one step in the right direction in that he washed out his locomotive boiler by means of hot water and he utilised the steam which in the past had been wasted for heating fresh cold water. It was not till 1904 that any further patents were taken out for hot-water washing systems within the scope of the name of "wash-out systems," but about this time there were quite a number of patents taken out for such apparatuses.

[Reply to E. JAMES.]

Somerset and Dorset Joint Line Tank Engines.

Two 2–4–0 tank engines, Nos. 27a and 28a, work on the branch between Edington Junction and Burnham and chiefly shunting at Highbridge.

[Reply to G. B. THATCHER.]

Somerset and Dorset Joint Railway.

Mr. Hopwood, the writer of the article in the May RAILWAY MAGAZINE, in reply to your query says:—

"I return letter. The statement made in the last paragraph is correct, but the Burnham Wharf the enquirer mentions is referred to in the Somerset and Dorset Joint Railway Working Book as *Highbridge* Wharf. It is about half-way between Highbridge and

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Burnham on a branch line. It was the first portion of the railway to be opened (1854) and was referred to in the article as Highbridge Harbour.

"Last July I closely examined the Burnham pier. It is now merely a stone breakwater with a single line of rails (disused) running down from the station to the sea: in fact, the sea washes over the lower end of the rails, even at low tide. So far as the railway is concerned, no shipping is now dealt with at Burnham pier, this being carried on at the Wharf.

"The reference to shipping routes from Burnham in the Midland map no doubt refers to the Wharf, which, as already mentioned, is officially called Highbridge Wharf in the Somerset and Dorset Joint Railway Working Book."

[Reply to "GWYNANT."]

Numbering of Midland Railway Locomotives.

The system of numbering engines adopted by the Midland Railway is as follows:—

	Nos.	Class.
Passenger Express:		
2-4-0 type	1-281	1
4-4-0 (early Johnson, many now rebuilt)	300-562	1 & 2
4-2-2 type	600-694	1 & 2
4-4-0 (later Johnson) ..	700-779	3
4-4-0 (Deeley)	990-999	4
4-4-0 compound	1000-1044	4
Tank Engines:		
0-4-4	1200-1430	—
0-4-0	1500-1532	—
0-6-0	1600-1959	—
0-6-4	2000-2039	—
4-6-4 (L.T. & S.R.)	2100-2107	—
4-4-2 („)	2110-2179	—
0-6-2 („)	2180-2193	—
Goods Engines:		
0-6-0	2300-2867	1 & 2
0-6-0	2900-3836	2 & 3

The blanks between the series of numbers are to allow for the building of new engines, if necessary. Numbers given above do not in all cases run consecutively from beginning to end, as some of the engines included, particularly those in the earlier and smaller classes, have been scrapped. Nos. 990-999 (the Deeley 4-4-0 engines to which we presume you refer) have all been rebuilt with superheaters and extended smokeboxes. The other particulars asked are too extensive to deal with here. We do not know of a book of the character you desire.

[Reply to RALPH B. WALLIS.]

London and North Western Railway Engines.

In regard to 0-6-0 goods engines our Crewe correspondent writes: "No fewer than 943 engines of this type—including 86 which were supplied new to the Lancashire and Yorkshire Railway—were built at Crewe between the years 1858 and 1874. Of the 857 engines of the type which ran on the London and North Western Railway, 500 were subsequently rebuilt by Mr. Webb with larger boilers, etc. Only the earliest-built engines bore names, and these had all been removed by 1864. The last of the unrebuilt engines disappeared many years ago, and recently there were about 130 of the rebuilt engines running."

[Reply to J. R. WHITAKER.]

To supplement the information given by Mr. Ahrons in the April RAILWAY MAGAZINE concerning the London and North Western Railway "single" converted into a compound in 1878 Mr. C. Williams says: "This engine became 1830 in 1871, and 1874 the year following. Under the latter number it was converted to a compound in 1878, and finally, about 10 years later, it became 3088. As a triple expansion engine (to which it was converted in 1895) this engine saw no actual service. For some years prior to its being scrapped it was out of use in the Crewe Works, and very probably had remained as converted till the last."

[Reply to W. T. HALL.]

British Four-Track Main Lines.

You are right in supposing the 74½ miles between St. Pancras and Glendon Junction, Kettering, Midland Railway, as being the longest stretch of continuous four-track main line in this country, although purists might object that the deviation of the goods lines from the fast lines between Souldrop Box and Irchester South Junction (about 3 miles) breaks into its continuity. The Midland also has another long four-track section of 51 miles between Wigston Junction and Tapton Junction, Chesterfield. Second in the list comes the London and North Western Railway with the 60 miles from Euston to Roade, followed by the Great Western Railway from Paddington to Steventon, 56½ miles, and the London and South Western Railway from Waterloo to Battledown Junction, Basingstoke, 51 miles. The Great Northern Railway has a greater proportion of its first 100 miles out of London quadrupled than any of the lines mentioned, but the continuity of the four tracks is broken

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in five places, *e.g.*, Potters Bar, Welwyn, Arlesey, Huntingdon, and Holme, aggregating in length about 18 miles out of the total. The London and North Western Railway has the greatest aggregate mileage of four-track road, *i.e.*, 262 miles.

[Reply to A. CUTTIFORD.]

Rear Lights on Trains.

At present there is no uniformity in the matter of rear lights for goods and passenger trains, and it would be impossible here to go into the variations practised by different railways. Generally speaking, all trains without exception must carry by day an unlighted lamp at the back of the last vehicle: if the last vehicle is a corridor coach, two lamps are often used, one on each side of the gangway connection. At night either two or three red lights are shown at the back of a passenger train unless the last vehicle be a slip coach, in which case an additional white light is exhibited, or unless there is a special train following, when an extra red light is employed, and fixed in such a way that one of the red lights in the centre of the vehicle-end is immediately under another. In the latter instances, also, it is often customary to duplicate the indications on each side of the gangway connection of a corridor vehicle, in order that they may be seen by signalmen and others concerned without difficulty. By day the indications for slip portions and trains following are given by boards of various shapes and colours, which it would take too much space to enumerate. The subject, indeed, is an extensive one.

[Reply to R. D. GAULD.]

Working Steam Pressure.

The working pressure of a locomotive is the pressure in lbs. per square inch at which the safety-valves are arranged to blow off. Generation of steam in an enclosed space such as a boiler obviously results in an increasing outward pressure of steam against the boiler plates, and by suitably setting the springs of the safety-valves the working pressure may be fixed at any level within certain safe limits. Thus, so long as the engine is properly fired, steam is delivered from the boiler to the cylinders at the blowing-off pressure of the safety-valves, *i.e.*, the "working" pressure of the engine. The latter is varied according to the tractive power required of the locomotive, and is generally at its highest figure in the case of engines used on fast and heavy express passenger or heavy goods service. Increased working pressure, however, generally entails increased costs in boiler maintenance, and this is why superheating has proved particularly valuable in that it allows of reduced working pressures without a correspondingly reduced tractive effort.

[Reply to E. STANLEY-JONES.]

Fastest Railway Runs on Record.

The fastest railway run on record in the British Isles was that made by the Great Western Railway 4–2–2 engine No. 3065, *Duke of Connaught*, on May 9th, 1904, with the Transatlantic mails from Plymouth to London, when the 118½ miles from Bristol to Paddington, *viâ* Bath, were covered in 99 min. 46 sec., start-to-stop, at an average of 71·3 miles per hour. But this time included a slow to 10 miles per hour through Bath station, and another to walking pace for the renewal of Cricklade bridge at Swindon. The 81¾ miles from Wootton Bassett to Westbourne Park were covered in 62 min. 55 sec., also including the latter check, and the average speed for most of the journey beyond Swindon was about 80 miles per hour. In the United States, on July 20th of the same year, the "Atlantic City Flier" of the Philadelphia and Leading Railroad, booked to cover the 55½ miles from Jersey City to Atlantic City in 50 min., is reputed to have completed the trip in 43 min., at an average of 77·4 miles per hour; this is probably the "record" for the U.S.A.

[Reply to H. E. WELLS.]

Straight Line "Records."

It is not possible to say which is the longest unbroken stretch of straight or level line in the world: the steppes of Russia or the prairies of North and South America could both, probably, produce aspirants to that honour. In this country the longest straight stretch is probably the 26 miles of the Great Northern Railway from just beyond Werrington Junction, Peterborough, to a point about 1½ miles south of Boston, Lincolnshire, which is practically dead level also. The North Eastern Railway also has a long straight and level section of 22 miles from the 1¼ mile-post out of York to a point about a mile north of Thirsk. It is customary to quote the 46 miles of the old South Eastern main line, from Redhill to Ashford in this connection, but this length is not absolutely straight, though nearly so, and it is not level.

[Reply to H. E. WELLS.]

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Leeds Junction.

The original junction between the Leeds and Thirsk and Leeds and Bradford railways was at Leeds and Thirsk Junction just east of the point at Holbeck where the Lancashire and Yorkshire and Great Northern lines cross overhead. In contemporary plans, memoranda, etc., the junction is variously referred to as "Leeds & Thirsk Junction," "Leeds No. Junction," "Leeds Mid. Junc." and, as often as not, simply "Leeds Junction."

North Eastern and Great Northern Joint Line.

The portion of line from the present Wortley Junction to Geldard Junction formed part of the old Leeds and Thirsk Railway and was opened in 1848. The portion between Geldard Junction and the old Leeds and Thirsk Junction was opened in 1850.

[Replies to ANGLO-SCOT.]

The Tay Bridge.

The first Tay Bridge, 3,465 yards long, was opened June 1st, 1878, and immediately taken over by the North British Railway at a premium of 30 per cent. It fell on the evening of December 28th, 1879, a train containing 72 passengers being lost in the disaster. Immediate steps were taken to rebuild the bridge, the new one being opened June 13th, 1887—just thirty years ago. The present bridge is over 2 miles in length, is constructed on the lattice-girder type, and is laid with a double line of rails throughout. It consists of 85 spans, the widest over the channel of the river being 245 ft. each, and giving a clear headway of 77 ft. above high water mark.

[Reply to A. V. SINCLAIR.]

London and South Western Railway 4-6-0 Locomotive No. 457.

No. 457 belongs to the late Mr. D. Drummond's 453–457 series of engines, built in 1908. They succeeded the pioneer 330–334 set of 1906, and No. 335 of 1907, from which they differed in having 4 ft. 9½ in. instead of 5 ft. 6 in. boilers, while still retaining the same driving wheel diameter of 6 ft. Similarly the four cylinders were reduced in size to a diameter of 15 in., the stroke being 26 in., as against the 16 in. by 24 in. cylinders of Nos. 330–334, and the 16½ in. by 26 in. cylinders of No. 335 (since re-built by Mr. R. W. Urie as a two-cylinder engine). Five more engines of the same class as Nos. 453–457 appeared in 1911, and took the numbers 448–452.

[Reply to J. S. Cox.]

Great Western Railway Locomotive Names.

There is no Great Western locomotive in whose name the word "Devonshire" occurs, but two boast in their nomenclature a direct connection with that county, viz., No. 3270, *Earl of Devon*, and No. 3835, *County of Devon*. Both are of the 4–4–0 type, the former being a 5 ft. 8 in. inside-cylinder engine of the "Bulldog" type (see illustrations in "British Locomotive Practice and Performance" in the May RAILWAY MAGAZINE) and the latter a 6 ft. 8½ in. outside-cylinder engine of the "County" class.

[Reply to J. S. Cox.]

Great Western Railway Outside-Cylinder Express Engines.

This query is not very explicit. Practically all the Great Western Railway outside-cylinder locomotives have a combined sheet steel casing to the cylinders and the piston-valve chests above them, which serves to keep the non-conducting "clothing" of cylinder and chest in position. We have never yet seen an engine running with this casing removed, but it is possible that, in consequence of some defect or mishap, the engine seen by our querist was temporarily at work in this condition.

[Reply to CADET P. L. WILLS.]

Australasian Railway Gauges.

In Australia the most common gauge is 3 ft. 6 in. This measurement is in vogue in Western Australia, Queensland, Tasmania, where, however, some 2 ft. gauge line is also in existence. In New Zealand the 3 ft. 6 in. gauge is supreme. In South Australia nearly 1,000 miles of railway have been constructed with 5 ft. 3 in. gauge, but the whole of the remaining mileage is only 3 ft. 6 in. In Victoria nearly 3,000 miles of line of the 5 ft. 3 in. gauge has been built and just over 120 of the 2 ft. 6 in. gauge. In New South Wales the gauge is similar to that which is normal in Great Britain, viz., 4 ft. 8½ in.

[Reply to CAPTAIN H. SIMPSON.]

Irish Traffic and the Railway Clearing House.

Clearance of the through traffic of none of the six principal railways in Ireland is entirely effected through either the British or the Irish Railway Clearing House, the venue being determined according to special arrangements made by the Companies concerned in the respective settlements. Steamship companies, as such, are not parties to the British Railway Clearing House, but by

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arrangement with some of the railways the Clearing House at Euston Square clears the traffic of certain lines. About twenty steamship companies are parties to the Irish Railway Clearing House.

[Reply to E. L. F.]

4-6-4 Tank Locomotives, Midland Railway.

There are eight of these powerful engines, numbered from 2100 to 2107; they were designed by Mr. R. H. Whitelegg and built by Messrs. Beyer Peacock and Co., Ltd., for the London, Tilbury and Southend Railway, and taken over with the other rolling stock when the latter system was acquired by the Midland Railway in 1912. They are now employed on heavy goods and mineral service between Wellingborough and Brent Sidings, Hendon.

[Reply to A. CUTTIFORD.]

Bridge Building.

Your query concerning this subject cannot be answered better than by quoting Mr. Alexander Ross, who has outlined the evolution of bridge building as follows: (1) Timber bridges, trestle work, and bridges built up of laminated segmental arches; (2) stone or brick arches; (3) parallel cast-iron girders for small spans and segmental cast-iron ribs for large spans; (4) wrought iron—parallel and lattice girder; (5) steel in parallel and lattice girders of various triangulations, developing into the cantilever system, of which the bridge over the Firth of Forth is the best example, one of its spans being nearly one-third of a mile clear opening.

[Reply to J. D. R.]

Fog Signals.

Detonators have been used on railways since 1841. There is no standard fog signal. Detonators as produced by different makers vary in detail, such as the weight of powder, the number of concussion caps, the thickness of case, etc. There is also the duplex detonator, which aims at providing in one case all the security given by two separate signals. Railways make it a rule that detonators must be tested every two months and not kept longer than three years.

[Reply to R. BLACK.]

Working Time-tables.

Railway working time-tables are private compilations for the use of the respective staffs only, and as such are not for the use of, nor are supplied by the companies concerned, to members of the general public save under very exceptional circumstances.

[Reply to L. Y. FIELD.]

A Line up a Railway Bank.

Possibly the line you describe is an incline up which railway trucks are hauled by means of a capstan and rope, but in absence of facts as to precise location, etc., no definite information can be given.

[Reply to CADET P. L. WILLS.]

Locomotives at Millbrook.

Probably the 0-6-0 engine you saw belonged to the Midland and South Western Junction Railway. This company has running powers from Andover Junction into Southampton. It possesses three 0-6-0 tank engines.

[Reply to W. F. A.]

The Forth Bridge.

The prescribed speed restriction over the Forth Bridge is 40 miles per hour.

[Reply to R. D. GAULD.]

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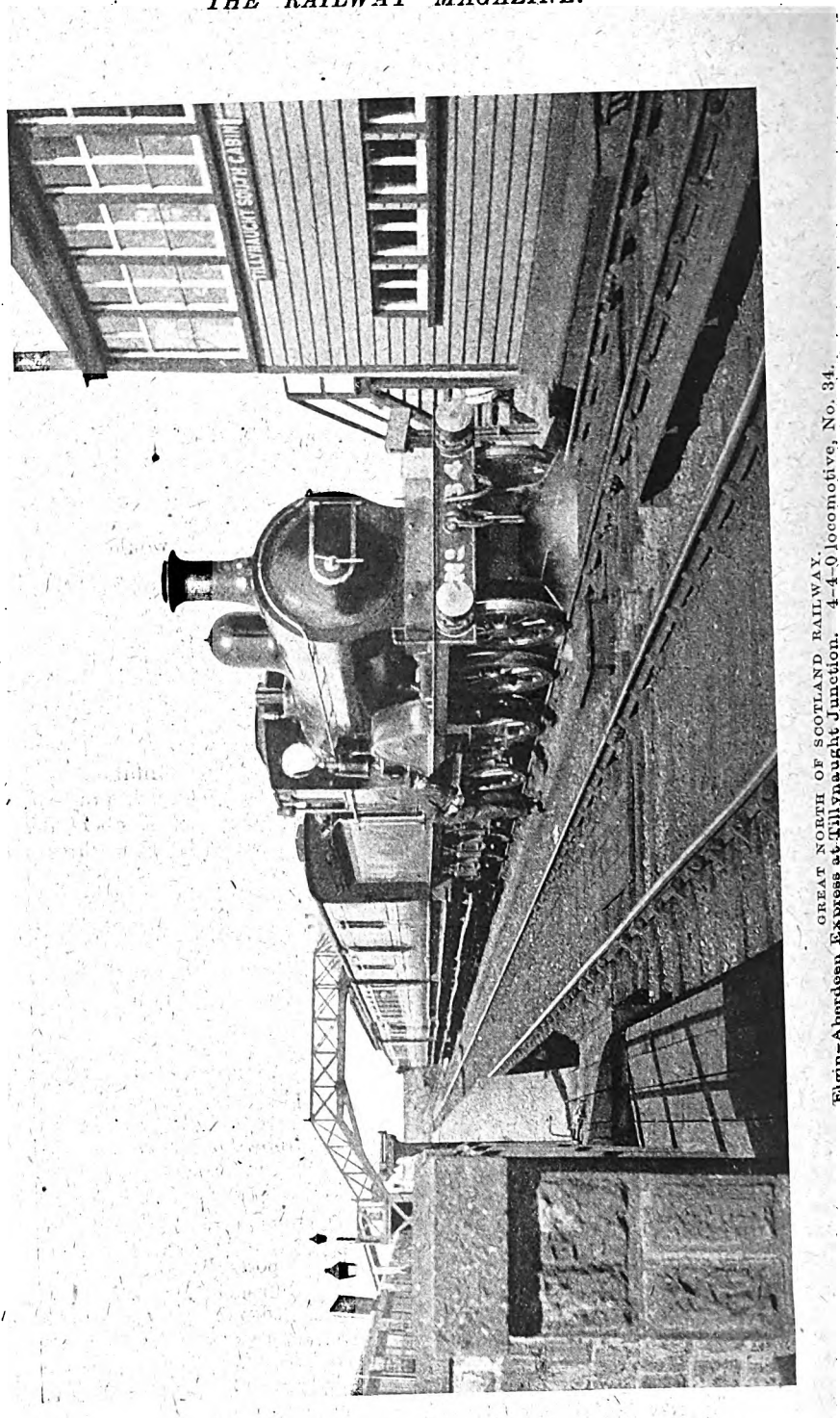
"OILING UP."



GREAT NORTH OF SCOTLAND RAILWAY.
Elgin–Aberdeen Express at Tillynaught Junction. 4-4-0 locomotive, No. 34.

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Railway Literature.

THE "SCIENCE OF RAILROADING": A plea for the establishment of an Institution of Transport. By Charles Travis. [The *Great Central Railway Journal* (May, 1917), Central Station, Leicester. By post, 2d.]

As a writer of books on railroading Mr. Travis is not unknown to RAILWAY MAGAZINE readers, and there are doubtless many who will read with considerable interest his able article in the journal referred to, at the head of this column. Mr. Travis is much in earnest and to those critics who would advance the argument that at the present juncture, when the whole energy of the country is being devoted to the supreme task of beating the Germans, he remarks: "I would observe that, just as the shaking up which the commercial and industrial concerns of Great Britain have received as a direct consequence of the war has encouraged proposals for the establishment of Institutes and Conventions to direct the study on more scientific lines of every branch of industry, so the almost complete revolution of railway methods, the changed conditions of labour and closer working arrangements with the Government will, I think, have the effect of impelling the railway companies to inaugurate certain schemes they have considered on more than one occasion. In the absence of official permission, I am not at liberty to say all I know on the subject, but I do not think I shall run foul of the Censor if I remark that more than one railway manager has expressed his belief in the future of such an Institute as the one I am about to propose. With these definite statements and the expression that I am thoroughly in accord with the maxim that instructs us 'in time of war, to prepare for peace,' I conclude this prefatory note and leave my article to be judged on its merits as an honest effort to advance the scientific study of railway questions."

We have not the space to quote largely from Mr. Travis, nor to follow him in detail throughout the illuminating arguments he produces in favour of his scheme, but we can well recommend them, as set forth in the *Great Central Railway Journal*, to the careful consideration of all those who are interested in his subject.

In regard to the location of the proposed institutes and their objects, it may be well to quote Mr. Travis in full. He states:

The proposed Transport Institute must necessarily be conceived on a wide basis. Obviously starting its career in the Metropolis, the intention would be to establish associated Institutes in the principal towns, Birmingham, Manchester, Newcastle, Glasgow, Cardiff and so on, the precise location being chosen specially from the view-point of drawing members from an area with a radius of, say, one hour's railway journey to the centre. The official support of the various railway companies would naturally be essential for the fulfilment of such an ambitious, yet necessary, programme, and it is suggested that members desiring to attend the Institutes for lectures or classes would probably be granted free travelling facilities in the respective areas.

As for the scope of the Institute, I must say that I feel it would be imprudent of me at this stage to lay down any hard and fast ideas on the subject, for the real scope would naturally have to be settled by the representatives of the various companies at their preliminary meetings. So far, however, as the Metropolitan Institute is concerned, I might, however, suggest (very tentatively) that the following list comprises a few of the objects for which such an Institute would be founded:

1. To promote among railwaymen a knowledge of the scientific principles underlying the work of transportation.

2. The diffusion, for this purpose, of a general knowledge of the functions of the several branches of railway activity.

3. The acquisition of information respecting railway theory and practice in the Colonies and foreign countries.

4. To encourage the growth of sympathy between the railways and the public by issuing, as and when necessary, statements respecting railway policy.

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5. To publish or to circulate for the use of members, and any persons qualified to be members that the Institute may think fit, any information that may be likely to encourage and exert interchange of thought, especially with a view to the creation of a friendly and sympathetic feeling between members and such other persons in their duties and labours, and for the mutual help of members in the discharge of their duties.

6. The promotion and encouragement of lectures, classes and discussions for the information and benefit of the Institute and railway students generally.

7. The acquisition, establishment and maintenance of a library or libraries, and the use thereof subject to proper bye-laws and regulations.

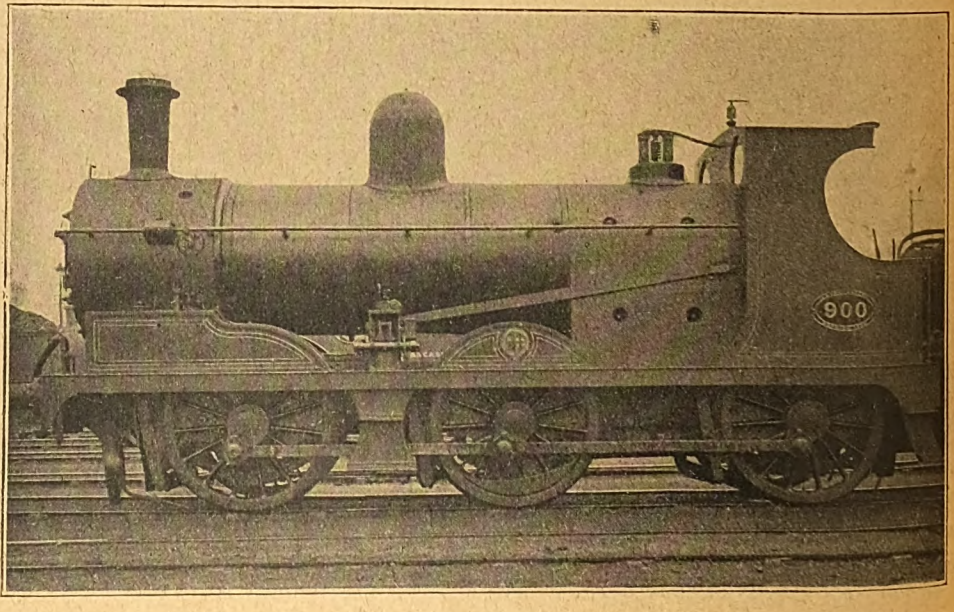
8. To institute examinations for the degrees of Associate and Fellow of the Institute.

9. To constitute a "Railway Positions" Bureau, to which colonial and foreign railways will be invited to apply when requiring British railway officers for their lines.

10. The doing of all lawful things incidental or conducive to the objects aforesaid or any of them.

With the exception of clauses 4 and 9, as to the desirability of which there would doubtless be controversy, it will be observed that the objects suggested all fall within the broad scope of the first clause, which, essentially definite and brief, must be the basic principle underlying the foundation of a Transport Institute.

0—6—0 SUPERHEATER GOODS ENGINE.



Photo] [*W. H. Whitworth.*

LANCASHIRE AND YORKSHIRE RAILWAY: LOCOMOTIVE NO. 900.

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Experience of British Railways under War Control.

An American View of the Situation, issued by the Bureau of Railway News and Statistics, Chicago.

WITHIN twenty-four hours after the British declaration of war on August 4th, 1914, the British Government, under powers conferred by the Regulation of the Forces Act, 1871, took possession of all the railways in Great Britain. Those of Ireland were not taken over until December 17th, 1916.

The words " took possession of " have to be taken in a purely Pickwickian sense, since the British railways were never taken over by the Government. Their operation was continued in the hands of their private owners. Only their service in the handling of everything pertaining to the movement of troops, munitions, supplies and all persons and goods " On His Majesty's Service " had to be rendered with the utmost dispatch, without red tape and without compensation. It was in the agreement as to this compensation and in the co-ordination of all the railways under an Executive Committee of railway officials that a new departure was made in the management of British railways.

There was no nationalization, no Government ownership, no direct interference with railway management of British railways beyond the imperative requisitioning of their services in all branches for the defence of the Empire.

The terms upon which this co-ordination of the British railways under the Forces Act of 1871 was effected were very simple and definite. Their co-operative management was vested in an Executive Committee composed wholly of the general managers of the principal companies under the nominal chairmanship of the President of the Board of Trade. All orders of general concern were issued in the name of the Executive Committee, as the writer witnessed on all station bulletin boards, within two days of its appointment. But no attempt was made to interfere with the prerogatives of the general managers respecting the conduct of business on individual roads. This went forward as usual with the one all-pervading exception that it was always subordinated to every movement " On His Majesty's Service." For traffic carried on account of the Government, whether military or naval, passengers, goods or coal, no fares or rates were to be charged or collected.

In lieu of such rates and fares, the Government has guaranteed to each individual company the same net revenue that it earned in the year 1913. It is well to mark here that the British railways are not to be compensated for their services as a national system, but each company is to have its net revenue maintained at the standard of 1913. The result of this has been to upset previous standards of receipts by abolishing settlements between the companies for their respective shares of the Government service. In the annual round up, some companies have balances to pay to the Executive Committee while others have deficiencies which the Government has to make up finally out of funds derived from general taxation.

Under this arrangement the war was not well under way before the railway wage question became acute. The rise in the cost of living made the scale of British railway wages inadequate and the unions demanded an increase. A bonus of five shillings a week was granted, one-fourth of which was to be paid out of the net revenues of the companies. As the cost of living continued to advance, a second bonus of five shillings a week was granted, all of which was to be borne by the Government.*

At this point the curtain of British censorship drops on the financial relation of the

* Since the above was written a third bonus of five shillings a week has been granted on the same terms as the second.

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Government and the railways. All that is known officially of the returns under this agreement for the year 1914 is expressed in the three lines :

Total receipts (including miscellaneous receipts)	£139,098,000†
Expenditure	88,173,000
Net income ..	£50,925,000

The dagger sign after the total receipts directs attention to the fact that they include the amount paid by the Government under its agreement for the period August 5th to December 31st. But what that amount was is carefully concealed. The single sheet announcing these results laconically notes : "In consequence of the war no further returns will be published for the year 1914 regarding the statistics of the railway companies of the United Kingdom."

It is known, however, that the service rendered in a military sense has been most satisfactory, but it has been at the expense of general public traffic. The movement of troops and war supplies has been prompt and expeditious. In order to enlarge the freight carrying capacity of the railways their passenger service has been greatly curtailed. The working classes in receipt of unprecedentedly large wages were inclined to travel extensively and packed the remaining trains to their capacity. This was remedied by an advance of 50 per cent. in passenger fares, the abolition of special and excursion fares, restrictions on luggage, etc.

The only thing known definitely about the financial results of the British railways under war conditions is that their working expenditures were as follows :

Year		Working Expenses
1913	All companies ..	£87,320,000
1914	All companies ..	88,173,000
1915	32 companies ..	89,016,203
1916	32 companies ..	97,627,510

For 1913 the net income of all the railways was £52,131,000. Adding this to the expenditures for 1916 would make £149,758,510, which is £14,042,762 more than the gross receipts in 1913.

The unanswered question is, what were the gross receipts from general traffic in 1916 ?

Another question which may not be answered until after the war relates to the maintenance of way and structures. In the interest of the stockholders the managers of the individual roads will doubtless endeavour to keep the plant in as perfect condition as possible, but the Government overseer will be jealous of any expenditure that will increase the deficit in net income.

How the British System would work in the U.S.A.

Now let us see how any such arrangement could be made to fit the railway situation in the United States. By Act of Congress they could be taken possession of in somewhat the same Pickwickian sense. An Executive Committee composed of the presidents of the representative companies could be chosen (like the Committee of Five already named), with the Chairman of the Interstate Commerce Commission as its nominal chairman, but one of its number serving as executive chairman. Working under this Executive Committee there would have to be a larger committee of general managers, or perhaps the organization of the American Railway Association might be enlisted. Then the terms of the British agreement of August 5th, as modified by experience, might be applied to all American railways.

In view of the exceptional net income of 1916, the Government might balk at making that the standard of compensation for the services it would requisition without accounting in rates and fares. But it could not do less than agree to compensate all the roads by a standard of the average net income for the calendar years 1914, 1915 and 1916—a lean year, a medium year and a fat year. For these years the net income was as follows :

Net Income of the Railways for Three Years

1916	$1,114,618,145
1915	899,660,315
1914	687,621,090
Total three years	$2,701,899,550
Average ..	900,633,183

Along with that guarantee should go a Congressional authorization of an immediate advance of at least 15 per cent. in freight rates and 25 per cent. in passenger rates—the former to protect the Government from an excessive deficit in the net income it guarantees and the latter to restrict general passenger traffic so as to release rolling stock for the movement of the Government's emergency traffic.

Any advance in compensation of railway

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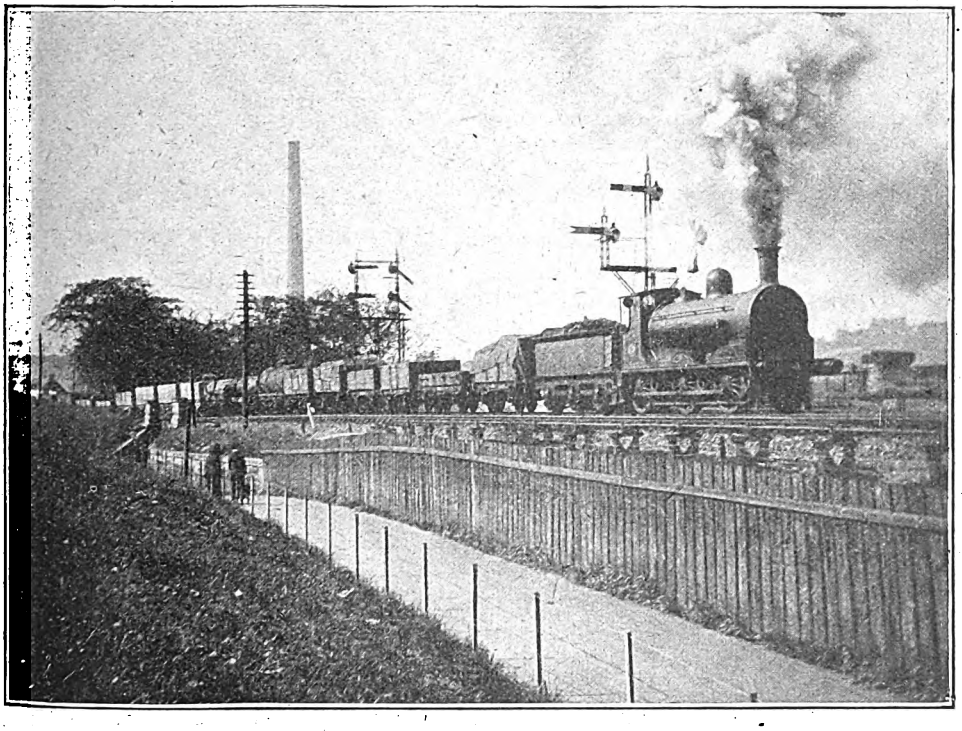
employés would require the sanction of the Government in order to protect its guarantee of net income.

In order to put the railways on a war footing, the Government might guarantee the issue of $500,000,000 4 per cent. railway income bonds. These should be apportioned among the companies in proportion to their incomes and be devoted to the immediate purchase of rolling stock, of which there is a national shortage.

For advice in putting this railway war programme into operation, the U.S.A. Government might procure the loan of H. W. Thornton, the General Manager of the Great Eastern Railway, England. Before going to England, where he has made a remarkable record, Mr. Thornton was for nearly twenty years in the service of different divisions of the Pennsylvania system, and is thoroughly conversant with the American railway conditions.

A MIXED LOAD.



Photo] [*A. E. Glen.*

CALEDONIAN RAILWAY.

Goods train passing Dawsholm Junction, Glasgow.
0-6-0 Locomotive, No. 353.

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PERTINENT PARAGRAPHS

To our Readers.

SINCE the outbreak of war, but particularly during the past twelve months, the publishers of the RAILWAY MAGAZINE have received from readers in all parts of the United Kingdom an abnormal number of direct orders for single copies of the magazine. Many a reader in writing will state he is doing so by reason of his regular newsagent, or that party's wholesale agent, being out of stock. This trouble can be overcome if each reader will act on the advice so often given and place an order with a newsagent to supply the magazine monthly until further instructed. Let the RAILWAY MAGAZINE reader make his newsagent clearly understand that unless he secures and reserves for, or delivers to him, a monthly copy of his favourite periodical he will take his custom for other goods elsewhere, and a marked improvement in prompt supply will take place. In the present state of the newspaper and magazine trade, consequent upon wartime restrictions, newsagents are afraid of ordering more copies of a periodical than they are sure of selling, and in most cases order much under their real requirements; hence the difficulty of obtaining a really popular publication in the old free and easy way. The RAILWAY MAGAZINE is not one that languishes on the railway bookstalls unsought and unsold.

Readers who wish to save themselves the bother of interviewing a newsagent and satisfying him that they really and truly intend taking the magazine monthly without fail and never by any chance leave it on his hands, may become direct subscribers. To any postal address the magazine can be mailed monthly on receipt of 4s. 3d. for six months, or 8s. 6d. for twelve months, payable in advance. This subscription rate applies to all countries save those at war with Great Britain, and to Canada and Newfoundland. To addresses in the two latter the subscription rate for twelve months is 8s.

Not alone in the RAILWAY MAGAZINE, but throughout the periodical press, urgent attention has for a lengthy period been drawn to the difficulties consequent upon the restricted paper supply, and the trouble dealt with in the foregoing paragraphs is the outcome of one of them. It is, however, one in which the remedy largely rests in the hands of RAILWAY MAGAZINE readers so far as this publication is concerned, and we rely with quiet confidence on our many friends co-operating with us in the manner suggested.

In passing it may not be out of place to point out that this, June, 1917, number completes the first twenty years consecutive issue of the RAILWAY MAGAZINE.

A Californian Correspondent.

LETTERS from readers far away from the British Isles have always a warm welcome at the offices of the RAILWAY MAGAZINE, and those from Mr. Eric L. Crickmay, of Oakland, California, U.S.A., are no exception to the rule. From a recently received and very pleasant communication the following facts and comments are culled:

"The finest piece of work I have seen since leaving England," he writes, "is the working of the Southern Pacific electric suburban service in this district. From 16th Street station, Oakland, to Oakland Pier station there are six tracks, two for steam trains and four for electric (overhead), and the running is very smart. On the arrival of a ferry boat from 'Frisco every 20 min. five electric trains start within about 3 min. for various points. There is a big signal cabin on the pier known as Oakland Pier Tower, and this controls the whole of the working into the station of 18 tracks. As a rule, four men are kept busy during the day, and the steel signal gantrys across the six tracks on the pier, each with home and distant signals for each track, remind one of Clapham Junction to some extent. The signals are two positions only, and go *down* instead of the usual American up for the off position. The Southern Pacific is a very interesting line, although the famous Shasta route is not in the same class for scenery as the main line of the Canadian Pacific Railway, which must be unbeatable. I went through the new Connaught tunnel in December, but it was at night time, and so I received no impressions! You will be interested to hear that there have been no Easter excursion rates on the Canadian roads this year, due to the War. This country is simply dripping money, and the railroads were never so prosperous before, but I think reaction will come before long."

Best Signalled Track in America.

IN addition to the foregoing, Mr. Eric L. Crickmay has forwarded a page from the *Oakland Tribune*, published in the Californian township in which he resides. The newspaper contains an article entitled "Train Signals that can't be delayed," and sub-headed "Oakland boasts the best safe-guarded three miles of track in America." Commenting upon the article, Mr. Crickmay says: "I can testify that the running

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of these trains is very good and a credit to the management." From the *Oakland Tribune* the following is taken:

American ingenuity and enterprise has recently solved an intricate problem in "safety first" as applied to the commuter traffic on electric railways.

The San Francisco-Oakland Terminal Railways operate a ferry system between the densely-populated cities on the east and west sides of San Francisco bay. The Oakland terminal is located 3·4 miles out in the bay and is reached by 2·7 miles of double trackage on a solid fill, and ·7 miles of double track, which, like the terminal, is supported entirely on trestle. Electric trains from eight lines converge on to these two main-line terminal tracks, calling for 520 regular train movements and 270 switching movements in a day's service of twenty hours. Heavy fogs are encountered at certain times of the year, when it is difficult to see signals at a greater distance than 200 ft., yet the schedule provides for the safe movement of trains at speeds of 36 miles per hour under a 45 sec. headway over the 3·4 miles of main-line track.

To master this problem, the Oakland Terminal Railways has to not only use automatic stops in connection with automatic signals, but becomes the first railway in the United States to use an overhead automatic stop in connection with signals which govern the movement of trains over interlocked switches to a terminal yard.

DANGER SIGNALS.

In the pier terminal yard, as in any other railway yard controlled from an interlocking plant, the switches and signals are so interlocked that when a signal is displayed for the movement of a train in a given direction over a route, danger signals are displayed on all conflicting routes, but, since the signals are equipped with automatic stops, a train can only move on a signal displayed for it. Should the motorman overlook and undertake to pass a signal set against him, the brakes are automatically applied, and his train immediately comes to a stop.

This automatic stop is accomplished by means of an arm connected with the spectacle casting which, when the danger signal is set, hangs in such a position that it engages the trip arm of a valve located on the roof of each car, and automatically makes an emergency application of the air brakes. The arm resumes its normal position after the required stop has been made. If a train is running against the normal direction of traffic, as is sometimes necessary, the valve is tripped in the against traffic direction, remains down without applying the air brakes, and is restored to normal position by a reduction in train line pressure, made when the train stops and reverses direction.

THE YELLOW LIGHT.

The use of a yellow light as a "calling-on signal," the application of an overhead automatic stop to interlocked signals and the control of a semaphore signal, a calling-on signal and an automatic stop, all from a single lever, are the notable features of this elaborate system.

As a further precaution against errors in transmitting orders over the telephone, and to permit the towerman to manipulate levers and note instructions at the same time, a telautograph set connects the train director's office at the terminal with the tower. This instrument furnishes a permanent record at both ends of all instructions given.

Railway officials say that this three and one-half-mile section of track is the most signalled in America.

Largest Railway Stations in the United Kingdom.

Too late for correction, and further delayed owing to the absence on military service of the writer of the article which appeared in the April RAILWAY MAGAZINE under this title, it was discovered that owing to a combination of circumstances a degree of injustice had been done to the Lancashire and Yorkshire Railway in regard to Victoria Station (Manchester), while full credit is not given in respect of the Central and Talbot Road stations at Blackpool (Joint with the London and North Western Railway), and at Southport (Chapel Street). As will be seen from the additional particulars set out below, Victoria station should rank considerably higher than as stated, and deservedly ranks among the leading stations in the country both in the number of platforms and the trains dealt with.

Actually, therefore, the great Lancashire and Yorkshire station in Manchester has "17" platforms, not 12, as before the last enlargement, there being 11 terminal lines (not 6). The longest platform is 856 ft. in length, and the total length of platforms 9,420 ft. The area of 13½ acres stated does not include that devoted to the Company's offices; and if the area occupied by these and the station limits be extended to include Victoria East Junction this figure should be 14¾ acres. Covered area is 10 acres.

It was also stated that Blackpool (Central) has "6" excursion platforms: there are however 8, making the total for the station 14, instead of 12. This correction may also be amplified by the following additional particulars. Including excursion platforms and lines, Talbot Road has 15 terminal platform lines and 7 other tracks; about 237 trains are dealt with daily; area of station is 13¾ acres; longest platform is 760 ft. long; and total platform length is 9,900 ft. At Central there are 14 platforms and 5 other lines; 241 trains are dealt with in the course of 24 hours; area occupied is 10 acres; longest platform 840 ft.. and total platform length 8,900 ft On the same basis Chapel Street, Southport, also requires mention, for including excursion platforms and lines there are 13 platforms, 3 other lines, 460 trains are dealt with in 24 hours, area occupied is 14¾ acres, longest platform is 1,138 ft., and total platform length is 9,213 ft.

Although the Lancashire and Yorkshire terminus in Liverpool (Exchange) comes somewhat

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further down the list, it may be mentioned that it has 10 platform lines, 1 other track, about 542 trains are dealt with in the course of 24 hours, area occupied is 10¾ acres, longest platform is 704 ft. in length, and total platform length is 6,406 ft.

"DX" Class Goods Engines, London and North Western Railway.

A LIVERPOOL correspondent has forwarded some interesting information concerning these well-known engines additional to that which appeared in the "Why and the Wherefore" of the April RAILWAY MAGAZINE. "The first of the class," he writes, "was built in November, 1858, and was numbered and named 358 *Falstaff*. This engine is still running, or was until recently, under the duplicate number 3331. Fifty-two of the earlier engines had names when built, but these were removed about 1864. The total number built for the London and North Western Railway was 856 (the last being No. 1289, December, 1872), while a further 86 were turned out at Crewe for the Lancashire and Yorkshire Railway. Of the London and North Western total, 500 were re-built by Mr. Webb, the remaining 356 being cut up very much in their original condition (save for the addition of cabs, closed splashers, modern chimneys, etc.) in the 'nineties or early 1900's, except three or four which were sold to other companies. Of the latter, three were disposed of to the East and West Junction Railway (now Stratford-on-Avon and Midland Junction) in 1892. I understand that 131 of the 500 re-built engines remained in service on the London and North Western Railway at the end of 1915, but a few more have been cut up since then." From the total number given above—942—these DX class engines must be by far the most numerous class of locomotives built from one design that the world has ever known.

Economical Use of Railway Wagons.

IN a period of peace and prosperity it is bad business for railway wagons to stand in sidings day after day waiting to be unloaded, but in war time and days of stress like the present it is of prime importance that no effort should be spared by the public and the railway staff concerned in order to obtain the fullest possible mobile service from all rolling stock.

The Board of Trade, by virtue of its powers under the Defence of the Realm Regulations, has recently re-adjusted the periods allowed to traders and others for the loading and unloading of railway wagons, and has introduced the important feature that contravention of, or failure to comply with, the order will be a summary offence.

For the loading of wagons at railway stations, wharves, etc., the period allowed is one day, as heretofore, exclusive of the day on which the wagon is placed at the trader's disposal. At docks and on private sidings, one day is allowed instead of two, as formerly.

For the unloading of wagons at stations the period of two days remains as before. This is exclusive of the day of receipt by the trader of notice of arrival. At private sidings two days are allowed if the wagon is returned empty and three days if reloaded, being a reduction of one day in the former case and two days in the latter. Shipment traffic at ports must be unloaded and the wagon placed at the railway's disposal within three days, exclusive of the day of arrival. This reduces the period formerly allowed by one day.

To the return of wagon sheets the order is likewise applied, and it allows the same periods as for wagons.

Nothing in the order prejudices or affects the right of a railway to recover demurrage or other charges on wagons or sheets, or the liability of a trader therefor.

By another order the Board of Trade has authorised railways to make use of private owners' wagons when these would otherwise be sent on the journey empty, and a third order authorises a railway to unload a wagon if the trader does not do so in due course and to recover any consequent expense from the party at fault.

L. & N.W.R. Athletic Club = Amateur Operatic and Dramatic Society.

WHATEVER the London and North Western Railway does is done well, and the recent performances of the charming musical comedy, "Miss Hook of Holland," given by the Operatic Society, were proof of this. The King's Hall, Covent Garden, was the scene of this entertainment, and crowded houses were the rule, the hall being almost uncomfortably filled at the third "show." In the title rôle Mrs. W. J. Manclark was a sweet-voiced and pretty heroine, Miss Wheway made a dainty *Gretchen*, and Miss Alice White gave a sparkling and jolly impersonation of *Mina*, bringing the house down with her song in the second act. As *Mr. Hook*, Mr. T. H. Green showed that he was an original comedian, achieving success without the slightest suggestion of Mr. G. P. Huntly, the creator of the character. *Slinks* had an amusing representative in Mr. Arthur C. Chapman, who brought in some delightful topical "gags." Mr. Arthur Tucker was effective as *Captain Paap*, singing extremely well and speaking in true military style; he was well supported by Mr. Parkinson as *Lieut. de Coop*. As *Bandmaster Van Vuyt*, Mr. Basil Mercer made an exceptionally fine hero, alike from the histrionic and vocal standpoints; his song and dance with *Mr. Hook* was one of the chief successes of the piece. Mr. F. Cottell gave a cheery and tuneful rendering of the difficult part of *Schnapps*, while the speechless *Van Eck* of Mr. Honeyborn was a clever character sketch. The Chorus, ably led by Miss Marjorie Fraser, was wonderful, quite up to West End standards; particular mention should be made of the unaccompanied male chorus in "Bottles" and the beautiful flower dance in the last act by eight clever young ladies. All this good work in view of the audience meant equally good work behind the scenes, Messrs. Manclark and Cheshire being most capable stage managers: nothing was forgotten,

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and all the performances went without a hitch. The production of the play was in the hands of Mr. Chapman, the dances being arranged by Miss Nancy Borrett with her accustomed skill. The Orchestra, provided by the Central London Orchestral Society, under the direction of Mr. David J. Thomas, was excellent, as also was the Band on the stage, the latter being provided by the Willesden Steam Sheds Silver Band; the playing of both sections left nothing to be desired. Mr. Chapman and Mr. Thomas were responsible for the training of the company, and the result, as expressed by appreciative audiences, must have been highly gratifying to them both. They received great assistance in all ways from Mr. J. Hollyer Hill, the Hon. Secretary of the Operatic Society. The front of the house was looked after by Mr. D. H. F. Meacock, the Hon. Acting Manager, and Mr. T. Carter, the General Secretary, assisted by a number of ladies and gentlemen who sold programmes and acted as stewards; this branch of the business was also carried out to the satisfaction of all visitors. After the last performance, Mr. Cecil F. Grasemann, the genial Chairman of the Club, made a speech on the stage, thanking all concerned for the good work they had put in; he announced the pleasing fact that the London and North Western Railway "Comforts for Wounded Soldiers Fund" had profited handsomely by these successful and well-patronised entertainments.

A Loss to the Midland Railway's Fleet.

MANY RAILWAY MAGAZINE readers have noted with regret that the torpedoing of the hospital ship *Donegal* involved the loss of another railway-owned steamer. The vessel was owned by the Midland Railway and employed in the Heysham–Belfast service. Built in 1904, the *Donegal* had an indicated horse-power of 6,000 and a registered tonnage of 550. In October, 1908, she had the misfortune to run ashore during a voyage from Heysham to Belfast one very foggy night. All the passengers were transferred in safety to another boat and the *Donegal* was refloated, none the worse for the adventure, the following afternoon. This is the sixth British railway-owned vessel to be torpedoed by the pirate undersea craft of the enemy. The previous five vessels lost in the war were:—The *Hibernia*—known when in the service of the Government as the *Tara*—and the *Anglia* of the London and North Western Railway fleet, the *Duke of Albany* of the Lancashire and Yorkshire and London and North Western Joint Fleetwood–Belfast service, the *Sussex* of the London, Brighton and South Coast and *The Queen* of the South Eastern and Chatham. In addition, the *Brussels* and the *Colchester* of the Great Eastern have been taken captive by the enemy, and there are three vessels of the Great Central Railway and two of the Lancashire and Yorkshire Railway detained in Hamburg since August, 1914.

Boiler Feed Water.

AN abstract of a highly instructive paper entitled "A Study of Boiler Feed Water," by Mr. Geo. L. Fowler, appeared in *The Railway Gazette*, May 4th last, and RAILWAY MAGAZINE readers who are interested would do well to peruse it. The author compares the boiler of a locomotive with a laboratory where chemical reactions take place in feed water impurities, and gives details of some tests carried out to determine the exact character of various feed waters and the treatment which was best to bring about their improvement. One of the tests was of especial interest because of the marked chemical changes that occurred in both the raw and treated water under the high pressure and temperature at which evaporation took place, and the most remarkable of the changes noted was the disappearance of the common salt which formed one of the ingredients. In the raw water the salt amounted to 1·45 grains per gallon, or 108·75 grains in 75 gallons, whilst but 67·33 could be accounted for in the concentrated water and none in the sludge, a loss of 41·42 grains or more than 38 per cent. At the same time the total organic matter in the 75 gallons was 60·75 grains, and but 19·68 grains were accounted for in the concentrated water and sludge. Again, there was a total of 236·25 grains of magnesium carbonate in the raw water of which none appeared in the concentrated water and but 15·46 grains in the sludge, together with the magnesium hydroxide. Finally, of the 131·25 grains of sodium nitrate that was in the raw water there was but 91·10 grains in the concentrated water, making a loss of 40·15 grains or about 30·5 per cent. The losses for carbonates are accounted for by precipitation.

Canal Development.

SEVERAL questions have recently been raised in Parliament concerning canals which serve to demonstrate the awakened public interest in the subject. Thus the President of the Board of Trade was asked what canals had been taken over by the Government, and to this Mr. Roberts replied: "The names of the independent canals in England which have been taken over by the Government are given in two orders made under the Defence of the Realm Regulations. In addition, there are a number of English canals which are owned by railway companies and have come into the possession of the Government with the undertakings of the controlled railway companies to whom they belong."

In response to another question as to whether the Board of Trade had yet taken over the control of any Irish canal; and, if not, whether it proposed to do so, the reply given was: "One canal in Ireland, the Royal, is the property of a railway company, and possession has been taken of it, together with the rest of the company's undertaking. Possession has not been taken of any other canals in Ireland, and I do not know of any present intention to do so."

The Royal Canal runs from Dublin to Longford and is the property of the Midland Great Western Railway, who, however, do not run

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boats on it, the traffic being carried on by private traders, who pay tolls to the railway company.

Coal for London by Canal.

As a war measure, Mr. Guy Calthrop has already proved that canals can be utilised to a certain extent for relieving the railways.

On April 25th two motor barges of a new type arrived at a Regent's Canal wharf in Pancras Road, London, having brought 50 tons of coal entirely by inland waterways from the Cannock Chase Colliery, near Birmingham. The trip was an experimental one. As the railways are suffering from congestion and labour shortage, and the sea-borne coal is exposed to risk of loss, the new motor barge, which is economical and quick in working, may prove of great value. A detachable motor is used, placed on deck above the bows, and connected with a light shaft and screw, all placed forward. In the course of the journey the barges traversed seven waterways, and travelled 160 miles in 67 hours.

In the hands of one so capable and possessing such keen foresight as Mr. Guy Calthrop, the lot of the coal consumer in London and the South will undoubtedly be greatly improved as time progresses.

Canals to Relieve Railway Pressure.

As stated in the previous paragraph, Mr. Guy Calthrop has proved the possibility of the better utilisation of canals to relieve railway pressure, but it will be well if all and sundry do not expect too much in this direction and, further, do not place too much reliance on the prospective paying capacity of inland water-borne traffic after the war. Conditions now and what will prevail then are largely different. A really authoritative writer on British inland waterways is Mr. P. Bonthron, and in a communication to the RAILWAY MAGAZINE he remarks:

"The question of canal development is again before the public, and perhaps you will permit a few lines on this subject from one who has travelled over 2,000 miles over the waterways of this country.

"There is much to be said in favour of the said development, especially in the direction where there are such industries as collieries, brickfields, or quarries, and like concerns.

"I would, however, particularly advocate their use within a radius of, say, 25 miles or so from a seaport town, for the good reason that the heavy dock and landing dues on general goods for distribution are thereby avoided. Beyond these advantages caution might be observed, as there are numerous difficulties to be overcome, the water supply being the chief, and no comparison in that direction can be made with such countries as Holland and Germany, with their natural advantages. Where the water has to be utilised by artificial means the expense would be so closely as to eliminate any advantage there is in the difference between the canal and railway rates, and, after all, the whole contention is to effect an economy. The writer has also found in his travels that the canals in England do not, generally speaking, pass through populous towns, likely to encourage heavy and paying water-borne traffic.

"Furthermore, the all-important point of wages must not be overlooked, as the canal boatman, if such development did take place, might not accept the rate of remuneration he is now receiving.

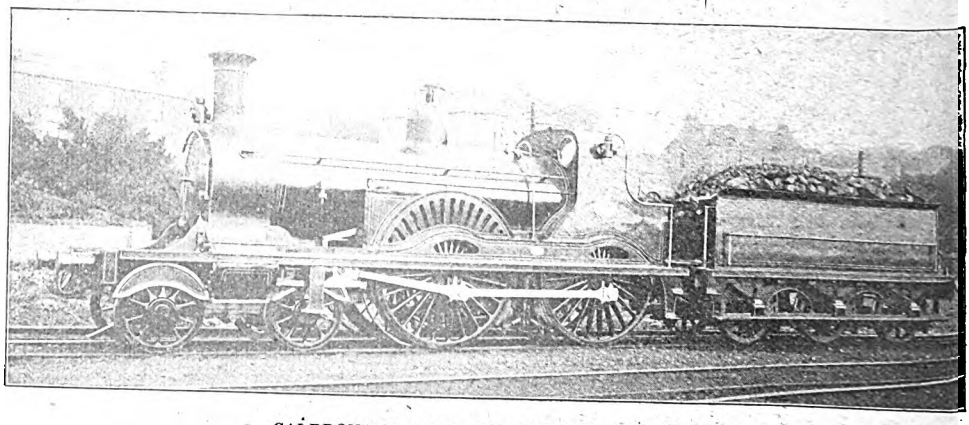
"These are points that want looking into seriously, and that on the top of the vast amount of capital required for such a reconstruction as is suggested."

We commend Mr. Bonthron's opinions to those over-sanguine advocates of intensive inland waterway development.

Old Caledonian Engines.

IN forwarding a photograph of Caledonian Railway Engine No. 126, which he has possessed for 23 years, Mr. T. R. Perkins, an old supporter of the RAILWAY MAGAZINE from its commencement and a valued occasional contributor, remarks:

"As you will notice, the photograph shows the engine as rebuilt by Drummond; as originally built it had a 'stovepipe' chimney and closed dome, with Ramsbottom safety valves



CALEDONIAN RAILWAY ENGINE, NO. 126.

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over firebox. The cab, too, was of different pattern. I never saw the engines in their original condition, but have seen a photograph of one of them, and I should fancy their appearance was much improved by the rebuilding; as rebuilt they were rather handsome, I consider. I have rather a weakness for the class, as my first trip on the Caledonian Railway was made behind one of them—from Glasgow (Buchanan Street) to Stirling, by the 7.15 a.m. express on the morning of September 1st, 1897. We were 'banked' out of Buchanan Street by a 0-6-0 engine in the rear, which dropped behind at St. Rollox. Curiously enough, that was the only occasion on which I ever saw one of the 123 class, and now I understand they are all scrapped. In 1912 I travelled from Princes Street to Stirling behind one of the 2-4-0's, which was nothing like such handsome engines as their 4-4-0 sisters. You will observe that the photograph shows the engine which—according to Mr. C. E. S. Littlejohn in the April RAILWAY MAGAZINE—was the last survivor of the class."

Track Tanks in the U.S.A.

As on British lines, the provision of pick-up water tanks between the rails has been considerably developed in the United States of America. In a paper recently contributed to one of the American Technical Associations, Mr. George W. Vaughan, Engineer for Maintenance of Way, New York Central Railroad, dealt with the subject from a trans-Atlantic point of view. He attributed the original inception of the idea to Mr. J. Ramsbottom, of the English London and North Western line, who in 1861 invented an outfit, including a track tank between the rails and a scoop on the locomotive tender. The track tank or trough was of cast-iron in lengths of about 6 ft., these sections being bolted together by means of flanges and the ends separated by strips of vulcanized rubber.

"It has been supposed," continued Mr. Vaughan, "that this was the first track tank ever put in service, but a few years ago Mr. F. W. Webb, Chief Mechanical Engineer of the London and North Western Railway, claimed that they were introduced on that road in 1857, and that he was engaged in preparing the first equipment."

"The first track tank in the United States was built at Montrose, between New York and Albany, on the Hudson Division of the New York Central Railroad, and put in service in 1870. It was for the use of the fast Saratoga trains at that time, and was supplied with water by a hand pump, no provision being made to prevent freezing, as its use was discontinued in the winter. Mr. Wm. Buchanan designed the first scoop, then called a 'jerk water.' It was attached back of the rear trucks and the conductor pipe placed back of and outside of the tender tank."

"The first track tank on the Mohawk Division was installed at Palatine Bridge about 1889 and the first one on the Western Division at Churchville in 1892. They were first installed on each of the four main line divisions of the Lake Shore and Michigan Southern Railway in 1893, and at Forks Creek, Tilbury and Waterford on the Michigan Central Railroad in the same year."

"The use of track tanks on the main divisions of the New York Central Lines has now become quite general. There are 14 on the New York Central Railroad between New York and Buffalo, 10 on the Lake Shore and Michigan Southern Railway between Buffalo and Chicago, and 14 on the Michigan Central Railroad between Buffalo and Chicago, so that trains can now run from New York to Chicago without making a single stop for water, except at the terminals where the locomotives are regularly changed."

Channel Tunnel Safeguards and Possibilities.

AT a recent gathering of the Royal Geographical Society, Sir Francis Fox said that owing to the necessity of keeping the Channel Tunnel well within the thickness of the grey chalk there would be a slight curve. The maximum depth of water over the Channel would be from 160 to 180 ft., and the roof of chalk over the structure had been fixed at a minimum of 100 ft. The tunnel would consist of two tubes of 18 ft. diameter. All the work would be done by electrically-driven machinery, and excavation and other operations would be carried on simultaneously at many points, and a record speed would be reached. The tunnel could be worked and ventilated and pumped by electricity from a Kent power-station ten miles inland.

The tunnel would have a dip in the level of the rails forming a water-lock by which the tunnel could, in case of emergency, be filled with water from floor to roof for the length of a mile. This would be under control of Dover Castle, and the entrance and exit of both tunnels would be under the gun-fire of the Dover forts.

After describing the way in which it would be constructed, the speaker went on to consult the Continental Bradshaw of the future. The Orient Express would start from Charing Cross and run through to Constantinople. Here, a train-ferry would take one portion across the Bosphorus, whence it might traverse Asia Minor, Palestine, join on to the Egyptian railways, and thus find its way south by the Cape-to-Cairo route. Another portion would go through Baghdad to Karachi and India. "Take your seats, please, for Constantinople and Calcutta; change at Scutari, Khartoum, Buluwayo, Johannesburg and Cape Town." The Nord Express for Petrograd would connect with the Trans-Siberian line and China. "It may seem to us," observed Sir Francis, "a very remarkable prospect, but it is by no means impossible of realisation, that within a comparatively few years travellers from London will be able to reach such distant places as India and China and the Malay States without leaving the railway systems of the world through the medium of the Channel Tunnel."

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Ladder Dredge for Clearing Snow.

As true to-day as when it was first coined—and that must have been a long time ago—is the adage, "Necessity is the mother of invention." One of the most serious troubles with which British railway officers have to contend is a heavy snowfall, but only those who have had actual experience of the circumstances can really appreciate the almost overwhelming potentialities of the snowfalls encountered from time to time on the Chilean Trans-Andean Railway. To deal with the consequences of these a ladder dredge for excavating snow has been designed by W. T. Lucy, of the railway's engineering staff. This railway is already equipped with a rotary snow plough built by an American firm, but Mr. Lucy states that in deep cuts when the snow is filled to a greater depth than 15 ft., the plough does not work well, as snow has to be shovelled off by hand from the top of the cut. More serious trouble is experienced when a deep cut is filled with snow by an avalanche, as pieces of rock are often brought down with the snow and cause much damage when struck by the rapidly moving blades of the rotary excavator. Mr. Lucy has therefore designed a snow-clearing machine consisting of two parallel ladders carrying endless chains of buckets of the pattern usually employed for excavating stiff clay. The snow excavated by these buckets is discharged into a hopper, from which it is discharged by gravity upon a centrifugal ejector which throws it either to the right or left of the track as required. The approximate weight of the machine is about 60 tons. The Chilean Trans-Andean Railway has not yet been financially able to purchase the machine, but intends to try it as soon as circumstances permit.

Canadian Railway Women Workers.

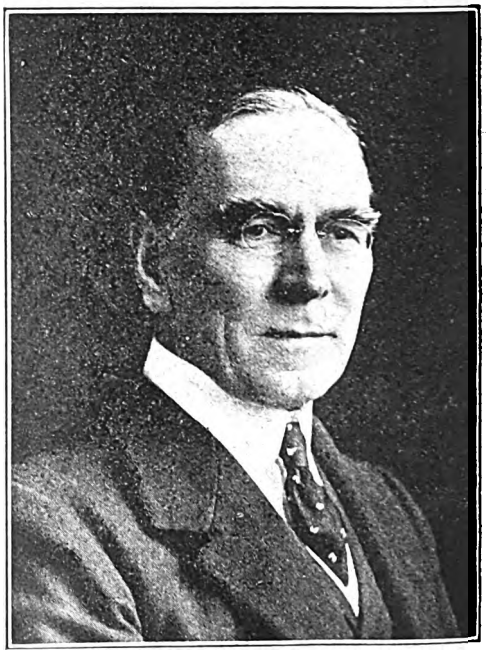
WOMAN'S place in the scheme of things has been considerably enlarged since the fateful outbreak of war in August, 1914. Not alone the railways of Great Britain, but those of the Greater Britains overseas have engaged feminine labour to an extent unpremeditated in pre-war days. In 1915 women workers were introduced into the Canadian Pacific Railway Angus shops, Montreal, and 200 are now there engaged. They have, says the *Canadian Railway and Marine World*, been organised and work under the supervision of Mrs. J. W. Bell, wife of the Superintendent of the Windsor Street station. Each woman has a locker in which she places her overalls and cap. At the outset it was difficult to induce some of the women to take kindly to the garments which tradition had marked out as male preserves, but after a little while every woman found these working dresses were more convenient than skirts. The overalls have three distinct recommendations: they are tidy, sanitary, and safe, allowing their wearers to move amongst the machines without danger of being drawn into machinery clutches.

The women work on the piece system, and they are paid at the same rate as the men. They work among the men with the harmony that prevails in offices where there are male and female clerks. In the Angus shops the women are to be found sweeping, coach washing, coach painting, working on drills, at lathes, at various kinds of machinery, filing and drilling in the brass shops, brass polishing, operating nut-tapping machines, cleaning dynamos in the electrical department, assisting in the steam-fitting centre, and making mattresses and pillows. No woman is asked to do heavy work. The women take the provisions for their lunch can with them, and these they may prepare in the lunch can room which accommodates 200. Soup and bread are provided by the company at cost. Attached to the lunch can room is a rest room, and near the rest room is a first aid room where accidents are treated. Seventeen of the women workers hold certificates of proficiency in first aid work, and their services are very valuable when accidents occur.

A Railway Solicitor's Connection with the Beaconsfield Papers.

MR. ERNEST ALBERT SCANES, who has just been appointed Solicitor to the London, Brighton and South Coast Railway in succession to the late Staff Captain P. Vivian Rose, is the second son of the late Edwin and Anne Scanes.

He was educated at a private school and at the University College (London) School, Gower Street, and after being engaged for some time in secretarial duties with—and until the death in April, 1883, of—Sir Philip Rose, first Baronet,



MR. E. A. SCANES,
Solicitor,
London, Brighton and South Coast Railway.

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he continued for Lord Rowton part of the work of arranging the papers Lord Beaconsfield commenced by Sir Philip Rose in 1881 and completed a few years later by Mr. Scanes' elder brother. The following letter, written to Mr. Scanes in December, 1883, by the late Lord Rowton, is perhaps not without interest in connection with that work and the recent appointment. Lord Rowton wrote: "I regret much to think that this is the last letter which I shall write to you on the subject of the Beaconsfield papers in consequence of your decision which, whatever my reluctance to lose your aid, I cannot but cordially approve. During the too brief time that I have had that aid, you have entirely gained my confidence in your care, your diligence, and your fidelity. You have done good work for which I desire to thank you—while expressing my sincere hope that your career in the profession you are about to enter may be prosperous and honourable."

In 1884 Mr. Scanes was articled to Sir Philip Frederick Rose, second Baronet, the then Solicitor and a present Director of the London, Brighton and South Coast Railway, and in November, 1889, was admitted a Solicitor of the Supreme Court. He remained with Sir Philip F. Rose until that gentleman's retirement from professional practice in 1908, when Captain Rose was appointed the Solicitor and Mr. Scanes the Assistant Solicitor of the Company.

In the course of over 30 years in the legal department of the railway, Mr. Scanes has had experience in its Parliamentary work and every branch of railway and steamship law—common law, Chancery, conveyancing, Admiralty, etc.

War Time-tables on the South Eastern and Chatham Railway: Some New Features.

FROM a lengthy, but welcome, communication from Mr. C. A. Hunt the following comments have been culled:—

"On most British lines the time-tables introduced at the commencement of the year present few features of interest, consisting as they do of the cutting out of certain trains and the insertion of compensating stops in the schedules of the remaining ones, together with a general reduction of speed between stopping places. But the South Eastern and Chatham Railway have also introduced certain fundamental alterations in their schedules which have hitherto escaped notice in the RAILWAY MAGAZINE, the most important of which is that on the South Eastern section, no trains, with the exception of less than twenty on week-days, serve both the principal termini of Charing Cross and Cannon Street, but some of them start or terminate at Cannon Street, and the rest at Charing Cross and completely ignore Cannon Street *en route*. Considering the length of time during which the famous 'Cannon Street complications,' as described by Rev. W. J. Scott, B.A., in an early number of the RAILWAY MAGAZINE, have been the outstanding feature in the working of the line, this innovation is very remarkable, and might almost be described as revolutionary.

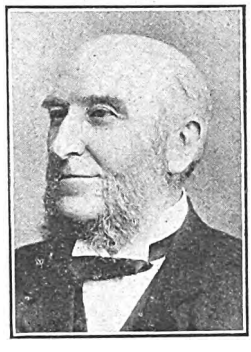
"On the Chatham section the time-honoured practice of running all main-line trains in twin portions to or from Victoria and either Holborn or St. Paul's, and uniting or dividing them at Herne Hill, has been considerably broken down of recent years, partly by the introduction of new trains not calling at Herne Hill (such as the City and Kent Coast express, the Victoria and Hastings and the Victoria and Deal *viâ* Maidstone East and Folkstone expresses) and partly, in the case of trains which still called at Herne Hill, by running the main train from and to one terminus only and a connecting shuttle train between the other terminus and Herne Hill. But since the New Year a much larger number of trains omit the Herne Hill stop altogether, and passengers by all the principal trains to Dover and the Kent Coast (except the two business trains in each direction for the latter destination) must now travel *viâ* Victoria only.

"Thus it has come about that the line which possesses four principal and two or three subsidiary London termini, has almost entirely given up the running of all important trains to or from at least two of them, and now as a general rule confines one train to one terminus; and it will be interesting to see whether this is destined to be a temporary or permanent feature in the working of the line."

A Link with Early Railway Days.

A WELL-KNOWN figure in railway circles has been removed and one of the few remaining links connecting the present times with the early days of railways has been severed by the death at the ripe age of 81 of Mr. Gilbert J. Stoker.

In 1854 Mr. Stoker entered the service of the London and North Western Railway at the Wolverhampton High Level station, which had then been opened only a few months. It was decided in 1859 to divide the line into eight districts, with a superintendent in charge of each, and Mr. Stoker was appointed to a position



MR. G. J. STOKER.

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in connection with the District Superintendent at Birmingham. In 1862 he was appointed Stationmaster at Leamington.

In 1865 Mr. Stoker was moved to Manchester, as Assistant to Mr. Sutton, Superintendent of the North Eastern District. About this period great alterations were taking place in the methods of working traffic ; electrical appliances, and the interlocking of points and signals were being introduced, and much of Mr. Stoker's work was in connection with the establishment of the block system in conjunction with the interlocking of points with signals. In 1869 Mr. Sutton was placed in charge of the Central District, and Mr. Stoker went with him, and became Assistant Superintendent, a post he occupied until his retirement.

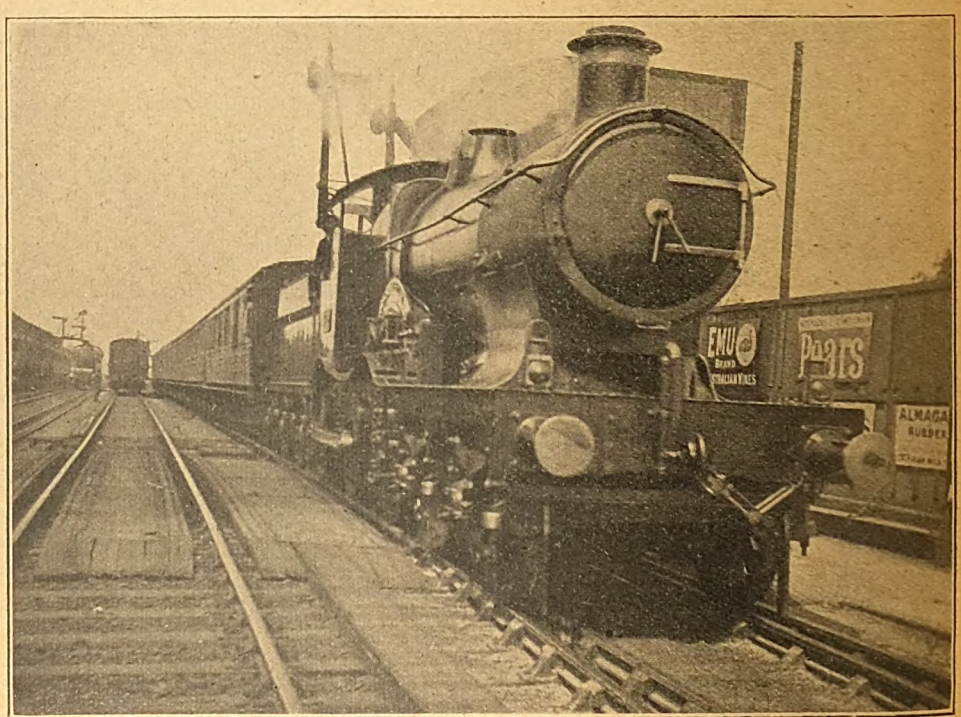
The welfare of the staff was one of his principal concerns. He was the originator of a scheme for providing premises in which refreshments could be obtained at any time by the New Street station staff, which resulted in the establishment of the New Street Station Coffee House and Refreshment Room Co., one of the first of its kind on the line.

In conjunction with other railway men he took part in the promotion of concerts in the Birmingham Town Hall in aid of the Railway Orphanage ; £1,000 was realised by three concerts, which were the means of making the Institution so well known in Birmingham, that when the funds of the "Best" Charity were distributed a sum of £1,000 was granted to the Orphanage. In addition to railway subjects which during his retirement remained of absorbing interest to Mr. Stoker, his hobby was literature.

For the RAILWAY MAGAZINE he wrote articles on the "Grand Junction Railway," the "Liverpool and Manchester Line," and on many subjects of railway interest. He possessed the ability to make technical subjects of interest as is indicated by the fact that lengthy reviews of his railway articles appeared in the *Daily Telegraph*, *Birmingham Mail*, and other newspapers.

When Mr. Stoker retired from the railway service in 1898, the occasion was marked by a presentation from the travelling public and one from the staff of the Central District.

Mr. Stoker's three sons are all in London and North Western Railway service, one on the Chief Engineer's staff at Euston, but now loaned to the Ministry of Munitions, where he occupies a post as Assistant Director, attached to the staff of Major the Hon. L. H. Cripps. One in the Superintendent's Office at Manchester, and the third in the Divisional Engineer's Office at Walsall.



Photo] [*A. Richardson.*

GREAT WESTERN RAILWAY.

Bristol Express leaving Oxford.
Flower-class 4–4–0 locomotive, No. 4102, *Blenheim*.

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WHAT THE RAILWAYS ARE DOING

MR. FREDERIC J. RAMSDEN has been appointed Chairman of the Furness Railway, in succession to the late Lord Muncaster. Mr. Ramsden had been Deputy Chairman for about two years. He first became a director in 1908 on vacating his position as Superintendent of the Line, Furness Railway, on July 31st that year. Mr. Ramsden had then had 26 years' association with the Furness Railway and to this he has added nearly nine years' experience as a director.

* * *

MR. RAMSDEN was the only son of the late Sir James Ramsden, formerly Locomotive Superintendent, and afterwards for many years Managing Director of the Furness Railway. Born in 1859, and educated at Eton and Trinity College, Cambridge, he is M.A. of that University. Mr. Ramsden is also a magistrate for the North Lonsdale Division of Lancashire, and a member of the Barrow and Ulverston Education Committees, President of the Barrow Chamber of Commerce, and President of the North Lonsdale (Barrow) Hospital.

* * *

BEFORE joining the Furness Railway service in 1882, Mr. Ramsden was in the office of the Superintendent of the Line, Great Northern Railway, King's Cross, and afterwards became Assistant Secretary and Assistant Traffic Manager of the Furness Railway. In 1895, when Mr. Alfred Aslett was appointed General Manager, Mr. Ramsden became Superintendent of the Line.

MR. FREDERIC J. RAMSDEN.
Appointed Chairman of the Furness Railway.

* * *

LIEUT.-COLONEL JOHN ARTHUR JACKSON, senior partner of Messrs. J. and W. Jackson, timber merchants, Whitehaven, Chairman of the Whitehaven Colliery Company, and Vice-Chairman of the Whitehaven Hæmatite Iron and Steel Company, has been appointed a Director of the Furness Railway to fill the vacancy caused by the death on March 30th, of the Rt. Hon. Lord Muncaster.

AT a presentation made to Mr. J. B. Ball, late Chief Engineer of the Great Central Railway, by his ex-brother officers, fourteen of them were present. Mr. O. S. Holt, Secretary, Great Central Railway, read letters from several other officers expressing regret at inability to attend and desiring that their good wishes should be conveyed to Mr. Ball. The General Manager, Sir Sam Fay, in formally making the presentation, a table centre-piece in the form of a silver dessert stand, mentioned that he, in common with all present, very much regretted that Mr. Ball had left the service, as he had always appreciated the professional assistance that Mr. Ball had given him. Sir Sam congratulated Mr. Ball upon the fact that although severing his connection he left nothing but the most friendly feelings behind him, and carried with him the very best wishes of all with whom he had been connected on the Great Central Railway. In replying Mr. Ball said that he relinquished his work with the Company with very deep regret because the engineering of the Great Central Railway had always been very interesting to him.

* * *

AT a meeting of the London "Safety First" Council, when a representative committee was appointed to deal with the "Safety First" movement on railways, there were present Mr. W. C. May (Chief Traffic Manager), Great Eastern Railway, Mr. H. E. Blain (Operating Manager), London Underground Electric Railways, and Mr. G. H. Dennis (Publicity Department), London, Brighton and South Coast Railway.

* * *

WE record, with regret, the death of Captain Philip Vivian Rose, eldest son of Sir Philip and Lady Rose, of Rayners, Penn, Bucks, who was born in 1869, and succeeded his father as Solicitor to the Brighton Railway in July, 1908, his grandfather, Sir Philip Rose, first baronet, having also been Solicitor to the same Company. He was educated at Harrow, and was articled in

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1888, first to the late Mr. H. E. Norton, and subsequently to his father, both being partners in the firm of Norton, Rose, Norton & Co. He was admitted a solicitor in April, 1893, after passing the final examination in January of that year, with honours.

* * *

MR. E. A. SCANES has been appointed Solicitor for the London, Brighton and South Coast Railway, in place of Captain P. V. Rose. Mr. Scanes had been Assistant Solicitor to the company since 1908. His portrait appears on page 436.

* * *

MR. W. B. WORTHINGTON, Engineer-in-Chief, Midland Railway, has been elected President of the Institution of Civil Engineers. Mr. Worthington comes of a railway engineering stock. Born in 1854, at Lancaster, where his father was then Engineer to the Lancaster and Carlisle Railway, after a four years' course at Owens College (1869–1873) he graduated in London University, and was articled to his father. At the end of his pupilage, after a year on the Carlisle Joint station reconstruction works, and a year as assistant to Messrs. Blyth and Cunningham, of Edinburgh, on Caledonian Railway works, he joined the staff of Mr. Baker, then Chief Engineer of the London and North Western Railway, and in 1878 was appointed Resident Engineer on new works in and round Manchester, and continued to act in that capacity under Mr. Baker's successor, Mr. Stevenson, until 1883, when he became assistant to his father. On the latter's retirement in 1886, he was appointed Engineer of the Lancashire Division of the London and North Western Railway. In 1890 he became Assistant Engineer of the Lancashire and Yorkshire Railway, and on the death of Mr. Hunt, in 1897, was appointed Chief Engineer, which position he vacated in 1905 to be Chief Engineer of the Midland Railway.

* * *

A NOTABLE director has been removed from the Board of the North British Railway by the death of Sir John Howard. He was famed for his philanthropy, and founded the Howard Charity and the Howard Convalescent Home at Brighton, where he resided. He was a Member of the Institution of Civil Engineers and the author of works on the great Atlantic cables. Sir John was in his 87th year.

* * *

A SPLENDID peak in the Rocky Mountains, "Mount Chamberlin," was named in honour of Mr. E. J. Chamberlin, President of the Grand Trunk and Grand Trunk Pacific Railways. The peak is at the southerly end of a massive mountain range in the Grand Fork amphitheatre, and is surpassed only by its near neighbour, Mount Robson.

* * *

MR. WALTER H. JONES, Chief Cashier, London, Tilbury and Southend section of the Midland Railway, recently appointed a Justice of the Peace for the County of London, has a long municipal record. He was a member of the old vestry of St. George's-in-the-East, was elected to the Stepney Borough Council in 1900, and still remains a member of that body; he has been an Alderman of the borough since 1906, and occupied the mayoral chair in 1912–13. He has also been Chairman of almost every Committee, including Finance and is the present Chairman of St. George's Guardians.

* * *

SIR FREDERICK GEORGE BANBURY, Bart., Chairman of the Great Northern Railway, in succession to the late Lord Allerton, has been a director of the railway for some years. He has sat in Parliament representing the City of London since 1906. He first entered the House of Commons in 1892. A Londoner by birth, he was educated at Winchester, and entered his father's firm as a stockbroker. He became a partner soon after he attained his majority, and was the principal before he had reached the age of 30. For many years he has been a prominent man in city circles, and is a director of the London and Provincial Bank.

* * *

LORD BESSBOROUGH, Chairman, London, Brighton and South Coast Railway, who is also president of that railway's centre of the ambulance branch of the Order of St. John of Jerusalem, in the presence of the General Manager and other officers, presented to Mr. James King, secretary of the centre, a framed engrossment on vellum of a resolution of thanks for his services in ambulance work, passed by the Chapter General of the Order, and bearing the signature of his Royal Highness the Duke of Connaught, the Grand Prior.

* * *

MR. J. STRACHAN, District Traffic Superintendent, Burntisland, North British Railway, has temporarily accepted an appointment under the Coal Controller, Mr. Guy Calthrop, and Mr. M. S. Strang, Control Master, Coatbridge, has assumed duty as Acting District Traffic Superintendent in his stead. Prior to Mr. Strang's appointment as Control Master at Coatbridge he was the Chief Assistant to the District Traffic Superintendent of the Monkland section, and previous to that he was agent at Inverkeithing and Perth.

* * *

MR. JOSEPH TATLOW, formerly manager of the Midland Great Western Railway, and now a director of that company and of the Dublin and Kingstown Railway, is inspecting the Letterkenny and Burtonport Railway on behalf of the Board of Works, and he is to report on its condition, and also to report upon its working, maintenance and development. The Burtonport Railway was constructed under the Light Railways Acts, and is worked by the London and Lough Swilly Railway. As recorded in the April RAILWAY MAGAZINE, questions have recently been raised in the House of Commons in regard to its condition.

* * *

BY the death in France of Mr. Cyril V. Smethurst the London office staff of the Buenos

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Ayres Great Northern Railway has lost one of its most popular members. Mr. Smethurst enlisted in the Honourable Artillery Company about 15 months ago and quickly made himself an efficient soldier. His promising career has prematurely closed in his 37th year. He was an exceptionally capable railway man. In 1904 and 1906 he visited the Argentine Republic and Uruguay.

* * *

A USEFUL railway career has been closed by the death of Mr. William Sutcliffe Marsh, Divisional Engineer for the Taunton Division of the Great Western Railway. The deceased, who was 64 years of age, was the second son of the late Mr. T. E. Mills Marsh, who was one of the engineers who assisted Brunel to construct the Great Western Railway. Mr. William Sutcliffe Marsh was Engineer to the Rhondda and Swansea Bay Railway until its working was taken over by the Great Western Railway, to whose engineering staff he was then transferred. He was

THE LATE MR. WM. SUTCLIFFE MARSH,
Divisional Engineer, Taunton, G.W.R.,
1909–1917.

appointed Divisional Engineer at Taunton, having charge of the Taunton Division, which includes the lines between Brent Knoll and Exeter, Taunton and Witham, the Weymouth lines, and the following branch lines:—Barnstaple, Minehead, Exe Valley, Culm Valley, Yeovil and Chard. He was also Consulting Engineer to the Rhondda and Swansea Bay Railway and the Jersey Eastern Railway. The principal works Mr. Marsh had in hand whilst at Taunton were the re-construction of St. David's station, Exeter, and the strengthening of the Castle Hill Viaduct on the Barnstaple line.

* * *

OWING to ill-health Mr. H. E. Roper has retired from the position of Great Eastern Railway London Divisional Commercial Superintendent, and he has been succeeded by Mr. Percy Syder, who has held a similar position in the Ipswich district, where he was particularly popular among the trading classes. The new Divisional Commercial Superintendent at Ipswich is Mr. Frank B. Day.

* * *

FOR 22 years, among many other activities, Mr. John Webb, a permanent way foreman attached to the London and North Western Railway's Engineering Department at Northampton, has represented his fellow workmen on the railway's Insurance and Provident and Pensions Societies. He has also represented the district in which he resides as councillor and alderman. Now he has been honoured by being appointed a magistrate for the County Borough of Northampton.

* * *

IN succession to Mr. J. Hamilton, resigned, Mr. A. Alcock has been appointed Railway Superintendent of the Manchester Ship Canal.

* * *

WE regret to record the death of Sir Henry Wiggin, Bart., a director of the North Staffordshire Railway. Sir Henry was in his 65th year, and he was an ardent supporter of the RAILWAY MAGAZINE.

* * *

AFTER 49 years' service with the London and North Western Railway, Mr. A. L. Lloyd, Chief Cashier at Euston station, London, has resigned his position.

* * *

A VALUABLE member of the Cambrian Resorts Association has passed away by the death of Mr. J. J. O'Sullivan, manager of the Corris Railway. He was formerly General Manager of the Cork, Blackrock and Passage Railway, but retired from that service on superannuation about 10 years ago.

* * *

MR. WILLIAM H. GOUGH, Goods Manager of the Cambrian Railways, with which he had been associated for fifty years, died suddenly at his office on May 10th. In his day he was a first-class cricketer, and played for Shropshire.

* * *

MR. JOHN QUIREY has been appointed Assistant Accountant to the Midland Railway. He commenced his railway career with the Belfast and Northern Counties Railway in the Audit Office under the late Mr. John Gifford in July, 1882, where he remained for upwards of nine years. In December, 1891, he was transferred to the Accountant's Office under the late Mr. Walter Bailey, and he was appointed Accountant of what is now the Midland Railway Northern Counties Section (Ireland) in April, 1914. The Midland Railway acquired the Belfast and Northern Counties Railway, July, 1903.

* * *

FOR a song entitled "The Raid," the music has been composed by Mr. W. J. Amphlett, of the General Manager's Office, London and North Western Railway, Euston. The production—a

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very creditable one—is being sold at threepence per copy.

* * *

For its new stationmaster, Ditton Junction, London and North Western Railway, has an official who has risen from the ranks. Mr. John Harrington commenced railway life as a porter at Stafford in 1875 and was transferred to Crewe as an inspector in 1883. He was then the youngest inspector on the system.

* * *

At Peterborough there has recently retired from the London and North Western Railway, on his 70th birthday, Mr. P. Henson, a railway guard with a remarkable record. Out of 51 years' railway service he had worked as a passenger guard for 50 years. Commencing in the Goods Department at Rugby, he was transferred to the Traffic Department and appointed as a guard, working for two years between London and Stafford and was then removed to Stamford and worked for 11 years between Stamford, Rugby and Blisworth. Northampton Castle station at that time was of minor importance, the platform accommodating a train of six four-wheeled coaches and there being only one small siding, when the line from Seaton to Yarwell Junction was opened, connecting up the Stamford and Rugby and Blisworth and Peterborough branches. Guard Henson was transferred to Peterborough and worked the first passenger train over the direct line from Peterborough to Rugby, previous to which passengers from Peterborough to Birmingham and the North had to travel *viâ* Blisworth, and has since worked continuously passenger trains over the N.N. and P. District for 37 years, and is proud of the fact that he has never been fined nor suspended from duty during the whole of his career and has never had an accident with any of the trains of which he had charge nor a passenger injured.

* * *

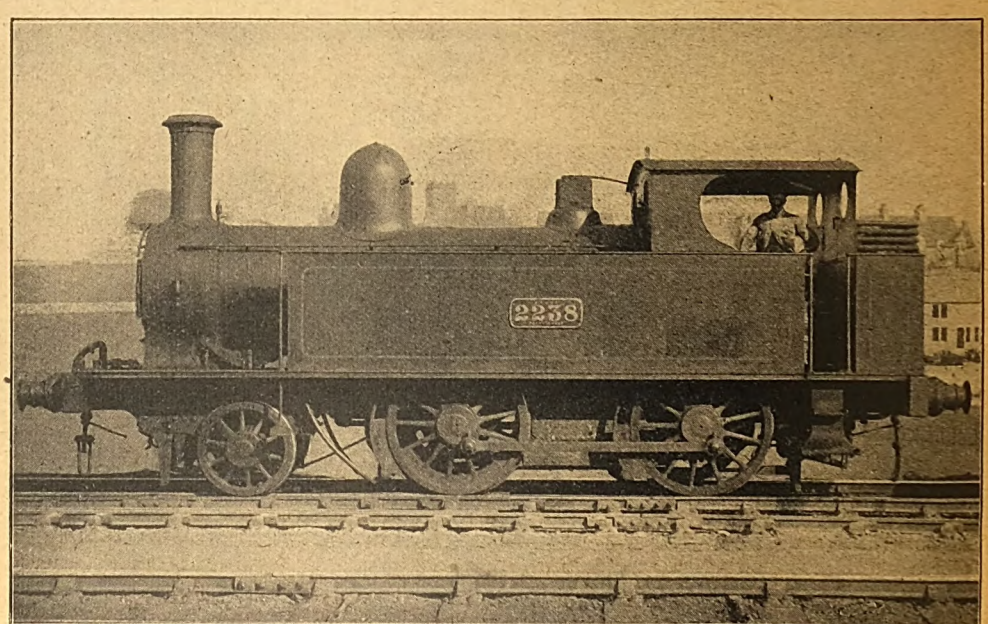
Cadet E. Stanley-Jones, R.N., is greatly interested in London and North Western Railway engines and would be glad if any reader will inform him through the Railway Magazine whether Nos. 1972 *Hindustan*, and 1956 *Illustrious*, originally 4–4–0 compounds of the "Black Prince" class, have been converted into simples of the "Renown" class.

* * *

Writing from Belper, Mr. E. B. Smyth, in reply to Mr. Rex. Leathley's question in the April Railway Magazine as to whether the famous London and North Western Railway locomotive, No. 790, *Hardwicke*, was still running, remarks that it may interest him and other readers to know that when engaged in an O.T.C. "field-day," near Seaton, Rutlandshire, on November 7th, 1916, he saw the *Hardwicke* working a train on the Market-Harborough to Peterborough branch of the London and North Western. "The faster trains on this section," adds Mr. Smyth, "are all worked by 2–4–0 'Precedents,' the slower trains by 0–6–0 Webb 'goods' engines. The train on which I saw the *Hardwicke* is timed at 36 miles per hour. Not bad, but 'How are the mighty fallen!'"

* * *

A new series of 0–8–2 side tank shunting engines has recently been put into service on the London and North Western Railway. They



Photo] [*Chas. H. Lang.*

LONDON AND NORTH WESTERN RAILWAY.
2–4–0 Tank Engine, No. 2238.

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bear the numbers 24, 92, 714, 1291, 1331, 2105, 2294, 2341, 2348 and 2391. Of a new series of four-cylinder passenger engines ("Claughton" class) the following will shortly be running:—Nos. 37 *G. R. Jebb*, 154 *Captain Fryatt*, 155 *I. T. Williams*, 162, 186, 713, 1334 and 2042 (no names). Several more four-cylinder compound passenger engines are being converted to simple ("Renown" class), including No. 1925 *Warrior*. No. 2204 *Sir Herbert Walker* ("Claughton" class) has recently had its name changed to *Sir Herbert Walker, K.C.B.* Three D. & S.E. 2-4-2 tanks of the London and North Western Railway 4 ft. 6 in. class have been under repair at Crewe.

* * *

In the March RAILWAY MAGAZINE appeared a lengthy illustrated description of the Dundalk Works of the Great Northern Railway (Ireland). We have pleasure in announcing that the switchboard therein described was supplied by the Hurst Electric Manufacturing Co., Belfast.

* * *

In regard to the new set trains for the Great Northern Railway (Ireland) Dublin and Howth Suburban service, mentioned by Mr. Gairns in his article referred to in the foregoing paragraph, Mr. R. W. Banks, Dublin, writes that it may prove of interest to RAILWAY MAGAZINE readers to know that one of them has been put into service. It consists of three bogie coaches, each 58 ft. long by 9 ft. 6 in. wide, as follows: Third brake composite, weight 31 tons; first, second and third composite, weight 32¼ tons; second brake composite, weight 31¾ tons. They are, in common with all Great Northern Railway (Ireland) passenger rolling stock, fitted with steam heating and Stone's system of electric lighting.

* * *

FURTHER engines on the Great Northern Railway (Ireland) to be fitted with new cast-iron chimneys in place of the old built-up ones, adds Mr. Banks, are as follows: No. 107 of the "P" class 4-4-0 express; No. 109, Class "C" 0-6-0 goods; No. 33, Class "A" 0-6-0 goods. Also Nos. 41, 193 and 194, Class "D" 0-6-0 goods engines, have been rebuilt with new boilers and fitted with cast-iron chimneys and new pattern cabs.

* * *

In reply to an enquiry by Mr. A. E. Edwards, junr., a Bristol RAILWAY MAGAZINE reader (J. N. F.) kindly replies:—

"Mr. Edwards asks if any reader can give him the numbers of the South Eastern and Chatham Railway engines which are working on the Great Western Railway. The following are the six working in the Bristol district at present:

No. 58 from Bricklayers' Arms (Shed 2).
,, 76 ,, Reading (Shed 18).
,, 138 ,, Tonbridge (Shed 5).
,, 350 ,, Strood & New Brompton (Shed 10).
,, 359 ,, Slades Green (Shed 4).
,, 406 ,, ,, ,, (,, 4).

They are all 0-4-4 side tank engines with coupled wheels 5 ft. 6 in. I should be glad if anyone could tell me where the one remaining Great Western Railway 'single' is working now."

* * *

ANOTHER correspondent, who signs himself "F. T. Loco.," writes that the engines in question are Stirling's 0-4-0 tanks and the numbers are 58, 138, 350 and 359. The same imformant states that "the Wainwright-Maunsell superheater express engine No. 775 is now stationed at Tonbridge (No. 5) and not at Bricklayers' Arms," as previously recorded. He further as a postcript adds: "Owing to the weakness of the Charing Cross Bridge, the South Eastern and Chatham Railway superheater side tanks, Nos. 129, 207, 597, 611 and 614, do not work into Charing Cross station."

* * *

CONCERNING the 38 tank engines of the 2-4-2 type owned by the Great Western Railway, Mr. G. H. Cannon writes from Bexley Heath:—

"These are the 37 mentioned by Mr. W. Beckerlegg in May RAILWAY MAGAZINE and No. 3593, converted from a 2-4-0T. This was until last summer at Penzance, but recently I have seen it at Reading and Didcot. The leading pair of wheels have outside axleboxes and the trailing inside. With its large cab and copper capped chimney it is rather reminiscent of the latest Great Eastern Railway 2-4-2T's."

* * *

FROM Wimbledon Mr. R. S. Clark writes:—"In May RAILWAY MAGAZINE a correspondent states that London and South Western Railway locomotive No. 238, a 0-4-4 tank, is stationed at Guildford on pull and push services. I think No. 238 is really a 0-6-0 tank. The following is a list of pull and push trains now in operation, that I know of.

Between.	Locomotives seen on these services.
Claygate and Guildford	190, 206, 212, 227 and 236,* 0-4-4T's.
Weybridge and Virginia Water	52 4-4-2T. 206 and 186 0-4-4T's.
Feltham and Hounslow	186, 206 and 212 0-4-4T's.
Clapham Junction and Kensington	207 and 208 0-4-4T's.

4-4-2 tank No. 524 was seen some time ago with apparatus fitted; could you tell me where this locomotive is working? 4-6-0 No. 447 and 4-4-0 467 have recently been fitted with Eastleigh superheater. Could any RAILWAY MAGAZINE reader give me full particulars about London and South Western Railway 4-4-0 outside cylinder locomotive No. 347? I believe it is of Adams' design."

* * *

A READER resident in Aberdeen (Mr. David L. Thomson) remarks: "I am afraid the supplanting of some of the 'Sir James King' 4-6-0 Caledonian locomotives by the new 4-6-2 tanks has not given the former a 'rise in the world.' No. 916 has now for a little time taken out a wholly goods train from here, and does not

* At Salisbury, June, 1916.

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appear to find it easy work. No. 64, one of the new 4–6–0 locomotives, is now in service between Aberdeen and Glasgow Central, arriving and leaving here at 2.25 and 5.30 p.m."

* * *

FROM Bath Mr. L. B. Hewitt writes :—"The illustrations on pages 321, 323, and 317 of the May RAILWAY MAGAZINE, taken in that order, show successive stages in the evolution of the 5 ft. 8 in. 4–4–0 locomotives of the Great Western Railway. The locomotive *St. Austell*, save for the Belpaire firebox, is as originally built. *Falmouth* is an engine of the same class, rebuilt with up-to-date cab and boiler fittings. The similarity of the frames will be readily noticed. Then No. 3349 shows the later pattern of frame, not cut down between the driving wheels."

* * *

ALL three types of Great Western 4–4–0 locomotives—the 5 ft. 8 in. "Duke" and Bulldog classes, the "City" class, and the "County" class (both with 6 ft. 8 in. driving wheels)—are now extensively used for goods traffic working on the Company's system.

* * *

READERS of the RAILWAY MAGAZINE may like to be reminded that the 2–4–2T tank engine No. 1304, which was broken up last year by the Great Western Railway, was illustrated on page 209 of Vol. 18, when the Manchester and Milford Railway was described. The illustration shows this engine in her original condition. Principal dimensions were given as : Cylinders, 17 in. by 22 in. ; coupled wheels, 5 ft. diameter ; and weight, 45½ tons.

* * *

THE Great Western Railway seems to have a penchant for numbering its "acquired" locomotives in the "1300" series. The 0–4–4 saddle tank, built in 1875 by the Avonside Engine Company for the Monmouthshire Railway and Canal Company, and used some years ago on the Bridport Branch, was numbered 1310. The number 1304 was allotted about the same period to one of the 4–4–0 outside cylinder passenger side-tank engines built at the Monmouthshire Company's Works in 1872, and used on the same branch. Then the small named 0–6–0 tank engines, many of which were in existence a year or two back, were numbered in this series, with one or two old 0–6–0 goods tender engines, built by an outside firm.

* * *

RESIDENT at Sutton (Surrey), Mr. J. May is greatly interested in London, Brighton and South Coast locomotives. He writes :—"There is an engine I should like to know the history of ; this is No. 689, a 0–6–0 tank with a large boiler and an extended smokebox. I have seen it at New Cross, Tulse Hill, Norwood Junction and Sutton, generally doing goods duties, etc. It seems to be the only one of its kind on this line. I daresay plenty of RAILWAY MAGAZINE readers have seen this locomotive. Could someone kindly give me any information about it ? Again, there used to be a tank engine which worked continually between Sutton and Banstead about 1906–8 which bore the name *Langston*. It was a Stroudley 0–4–2. This was when the Brighton Company painted its locomotives yellow and they had names : I believe the number of this one was 247. I have not been able to see 247 since this, but I wonder if any RAILWAY MAGAZINE reader knows this engine and if it once bore this name ? Also could anyone tell me what were the numbers of several others of the same type which bore the names *Coulsdon, Tunbridge Wells*, and *Anerley* ; and a 0–6–2T of the larger type called *Winchelsea* ? The only yellow engine I have seen for years is No. 591, *Tillington*, a large 0–6–2T, stationed, I believe, at New Cross."

* * *

IT is announced that members of the Leeds Corporation, together with the City Engineer, have been authorised to confer with the Engineer of the North Eastern Railway with regard to a proposed widening of the North Eastern line in the vicinity of Marsh Lane. By this attention is directed to a much-needed improvement in travelling facilities in and out of Leeds by the North Eastern system. Plans have been made and completed of a widening scheme between Call Lane and Eastfield Street, by which the present single up-and-down tracks between these points will be doubled and the old "bottle-neck" between Briggate and Marsh Lane abolished. Approaching the city from the east double tracks run as far as Eastfield Street, and just before entering Marsh Lane station they converge into single up-and-down tracks, to expand into double sets just before crossing the bridge over Lower Briggate. For years this inconvenient arrangement has resulted in congestion at this point, and much delay has been caused to trains in awaiting a clear line into New station. It is a large and expensive scheme, involving the removal of a certain amount of property, and the doubling of the width of the bridges and arches over Call Lane, Kirkgate, and Marsh Lane, and there is very little prospect of the improvement being effected during the war. The "bottle-neck" is a little less than ½ mile in length, and when the scheme is undertaken the North Eastern Railway will require the help of the Corporation in regard to street and property changes.

* * *

AT the Railway Club, 92, Victoria Street, London, S.W., the members who attended the May monthly meeting—and there was a goodly muster—enjoyed a most entertaining evening. Mr. W. Parker presided, and after the formal business for the month had been disposed of, the gathering proceeded to witness an excellent lantern exhibition of club-owned slides of engines and trains supplemented by others loaned by Messrs. Bailey, Bell, E. C. M. Miller, J. B. Sherlock and E. J. Miller. The two latter officers of the club—hon. treasurer and hon. secretary respectively—explained their own slides, but the others were in the capable custody of Mr. H. L. Hopwood. At the conclusion many present expressed the hope that another exhibition of the same character may be arranged.

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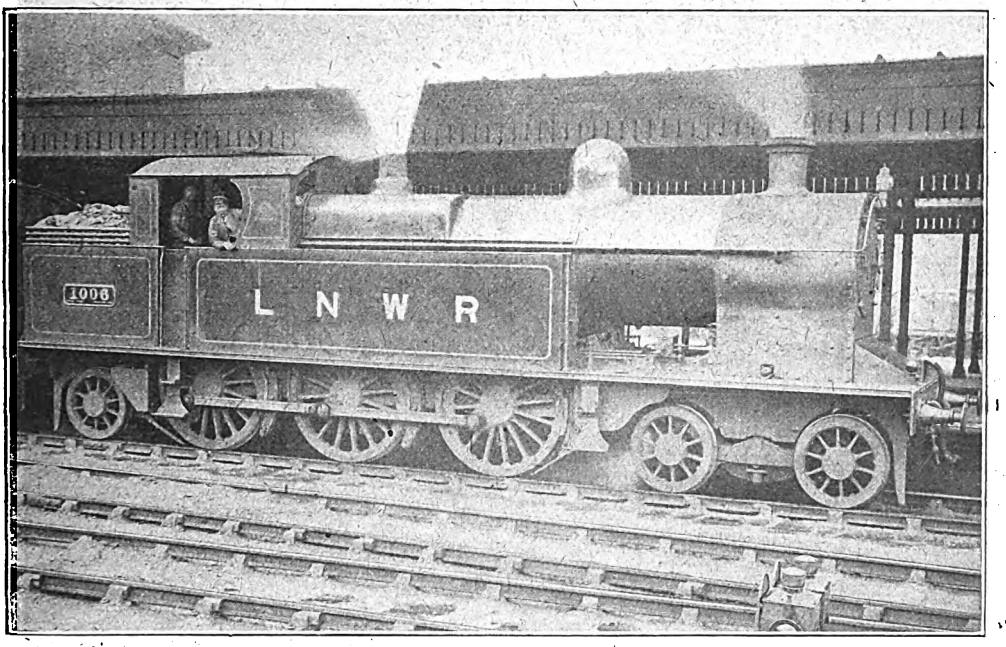

Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.
4-6-2 Superheater Tank Engine, No. 1006, at Stockport.

On Tuesday evening, June 12th, the Club is to be visited by Mr. Roy Horniman, who is to present a paper entitled "The Railway Tragedy." Visitors desiring to be present should write to the hon. secretary enclosing stamped and addressed envelope for a reply. Arrangements are under consideration for a few Club outings during the summer months in order that members may have opportunities of studying railway subjects "on the spot."

* * *

A VERY fine paper was read at the last meeting of the Model Railway Club on "Electric Traction and its Application to Model Railway Work" by Mr. J. L. Hayward, who is to be congratulated on his well thought-out contribution. Mr. Hayward illustrated his remarks with a number of blackboard drawings and wiring diagrams, and must have devoted a considerable amount of time to the preparation of his discourse.

* * *

QUESTIONED in the House of Commons as to what length of the proposed railway in Ireland from Athy to Wolf Hill was to be made on private land and what length on public roads; what was the reason for not acquiring land for the whole length; what steps had been taken to obtain the consent of the public on whose rights and safety it was proposed thus to encroach; whether before expenditure had been incurred steps would be taken to obtain the consent of the public; and if not, whether the Defence of the Realm Act would be used to prevent the public affected maintaining the freedom and safety of their roads, the Chief Secretary for Ireland replied: "I am not able to give the information asked for in the first part of the question. The construction of the railway was undertaken under the Defence of the Realm Regulations as a measure likely to help in the effective prosecution of the war. If direct and substantial loss is caused, the Defence of the Realm Losses Commission can deal with it. If land or interests in land are permanently acquired, they will when so acquired be paid for in the usual way. The local authorities and the people of the district concerned were among those who pressed most urgently for the prompt construction of the railway."

* * *

CAREFUL consideration has been given by the Board of Trade to the suggestion that the Government should secure possession of the Dublin and Blessington tramway, but the Board is unable to recommend it. This line is 15½ miles in length and was opened in August, 1888. It possesses four locomotives, 12 passenger and 35 goods vehicles.

* * *

APPLICATION is being made to the Board of Trade by the London Electric Railway for an extension of time in which to construct the railway from Golder's Green through Hendon to Edgware, which is to link up with the Charing Cross and Hampstead Tube.

* * *

MR. D. B. HANNA, third Vice President of the Canadian Northern Railway system, has announced that delivery has been made to the Duluth, Winnipeg and Pacific, one of the

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subsidiary railways of the Company, of 750 box cars, each of 40 tons capacity. Other rolling stock received by the Canadian Northern includes three electric locomotives, one of which is for the Mount Royal tunnel service.

* * *

AN American correspondent states that the Canadian Pacific Railway is introducing a mask in locomotive cabs, whereby the locomotive drivers have a clear vision ahead in all kinds of stormy weather. It is attached to the window frame of the engine cab and contains no glass, its principle being based on the deflection of wind currents by flanges. Between the upper plates of metal and an air chute is a broad slit through which the driver surveys the railway track ahead.

* * *

FROM Bond Court, Walbrook, the Canadian Northern Railway system has removed its chief London offices to Orient House, New Broad Street, E.C.2.

* * *

IT is announced that Mr. H. G. Burgess, the Irish Traffic Manager of the London and North Western Railway, has been appointed by the Government as Irish Shipping Controller. The duties of the office will be to regulate and co-ordinate shipping and railway services, with a view to facilitating the food supplies and other urgent traffic between Great Britain and Ireland.

* * *

FROM Melbourne it is cabled that the Trans Continental Railway to Western Australia will be opened early in September.

* * *

GENERAL sanction of the Secretary of State having been given, the scheme for the construction of a harbour at Vizagapatain, the Bengal and Nagpur Railway engineers are engaged in a detailed survey of the harbour.

* * *

ON account of coal shortage the traffic on the railways in Denmark has decreased to a remarkable degree. In fact, the figures have dropped to the level of 37 years ago.

* * *

IN the House of Commons recently the Under-Secretary for War was asked by Sir J. Harmood Banner, in what circumstances the number of Belgian engines now standing at Rouen were held back from use during the war, and why British engineers who had been sent to repair them had been refused permission to do so, and had been compelled to send locomotives from England whilst Belgian engines were lying idle and unused. To this Mr. Macpherson replied: "I understand that a considerable number of Belgian locomotives have been at the disposal of the British armies in France for several months past. My hon. friend is under a misapprehension in suggesting that the assistance of British engineers has been refused by the Belgian railway administration. On the contrary, I am informed that their help has been gratefully accepted."

* * *

FROM Eirdhoven comes the information that railway goods traffic from Germany to Holland has been almost at a standstill for a month, and as a reason attention is drawn to the great shortage in Germany of efficient railwaymen.

* * *

THE Unopposed Bills Committee of the House of Commons have reported with amendments the Sir W. G. Armstrong, Whitworth & Co., Ltd., Railways Bill. This authorises the construction of two short railways near Manchester which are intended to connect the promoters' works with the Clayton Aniline Company's railway authorised in 1916, which, in turn, connects with a branch line of the Manchester Corporation, which itself connects with the Lancashire and Yorkshire Railway. Running powers are granted by the Bill over the Clayton and the Corporation lines, so that the works thereby obtain a new direct access to the Lancashire and Yorkshire system. They had railway access before, but that excess was not capable of expansion, and the new connection is required in view of developments.

* * *

THE Bill contains power for the promoters to make agreements with the Clayton Company, the Manchester Corporation and the Lancashire and Yorkshire Railway as to the construction and working of the proposed railways. The promoters proposed a modification of the original clause in the Bill declaring the intended railways to be "private railways," but the proposed modification did not altogether commend itself to the Committee, which had previously made some objection to a similar clause in another Bill. The clause as originally drafted followed the wording of a section of the Clayton Company's Act, 1916, that section having been hurriedly inserted at the request of a Government Department.

* * *

IN spite of, or because of, the war, railway development is to the fore in South Russia. The British Vice-Consul at Kherson reports that the foundation of the railway between Merefa and Kherson is in complete order, and as soon as rails can be obtained they will be laid down. This line will be very important for the export of grain and ore from Kherson, and it is expected that it will be in full working order by the time foreign export will again be possible. The Government has officially confirmed the project for constructing a railway from Saratov to Alexandrovsk. The carrying out of this scheme will enable goods from the Saratov district to reach the port of Kherson *viâ* the River Dnieper, and *vice versa*, thus considerably increasing the volume of trade at Kherson. Progress is being made with the construction of the railway between Kherson and Djankoi, which will join Kherson with the Crimea-Kertch line.

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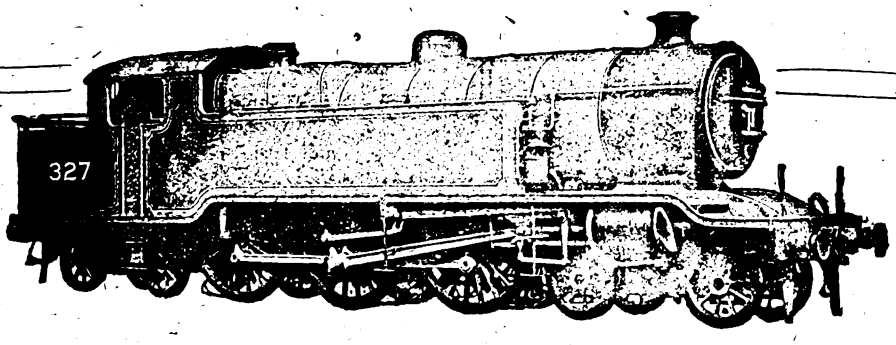

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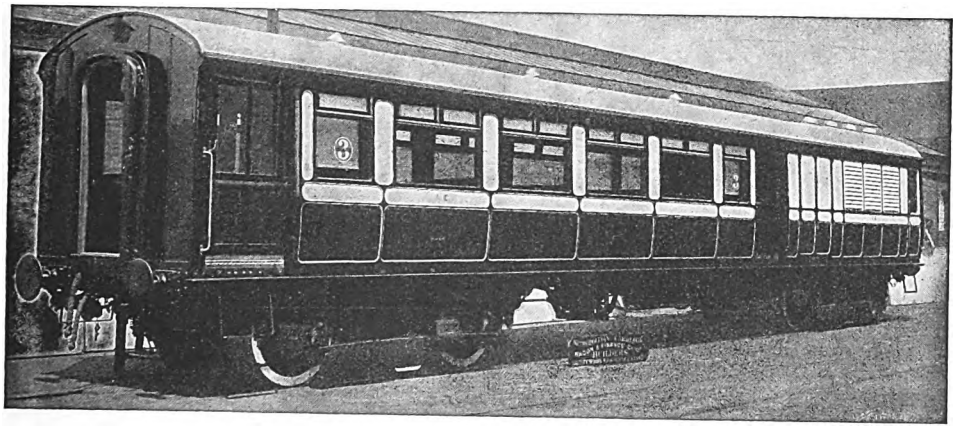

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